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SOME GROWTH PROBLEMS OF THE ORTHODONTIST AND THE OPERATIVE DENTIST

By KENNETH A. EASLICK, A.M., D.D.S., Ann Arbor, Mich.

A YEAR ago last September, Wilton Marion Krogman,[1] anthropologist, made the observation before a meeting of orthodontists that several sciences, including orthodontics, have designated human growth as their special field of investigation. It is unknown to Dr. Krogman, perhaps, that the children's dentist has been forced to become interested in growth; and unless he does become a serious student of the growth and development of his patients, he is bound to blunder in his diagnoses, in his efforts at interception of preventable malocclusion and in his practice of operative dentistry. Since the orthodontist's interest in the growth and development of children has preceded that of the operative dentist, it behooves the orthodontist to build up a rapport with the man in operative practice to help him, in truth, to a more scientific and rational operative dentistry service.

One of the most flagrant needs of the operative dentist is more information about social development and behavior at the preschool level. All who have not attempted to do any extensive operative work for small children will be helped if they are taught by the orthodontist to think of the preschool patient as a personality with twenty teeth who behaves in accord with the experiences in his family and neighborhood background. Too often, the operator is prone to focus on a single tooth, restore it and, in so doing, disregard and damage an entire young personality. Without a thorough knowledge of the social development of a 3-year-old patient, the dentist often hides behind a mustache, a white coat or the cold professional demeanor acquired during four long years in a dental school, and fails to render adequate service to his young patient.

Most adults need to be reminded of the social maturity of young children. A Northwestern University pediatrician and his wife wrote an entire book as recently as 1938 to remind physicians that babies are human beings.[2] In the March 1941 *Scientific Monthly*,[3] an anthropologist points out that the human infant looks at a light shortly after birth,

Read before the Section on Children's Dentistry and Oral Hygiene at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 30, 1941.

reacts to sound within a few days after birth, has a well-developed sense of taste, and has learned to suckle and to move his extremities (to kick, if you please) even before birth. Within limits, the baby arrives on earth a "going concern."

This "going concern" doubles his weight in five months or less, triples it in one year, and quadruples it by the end of the second year. At the age of 2 years, he will have reached approximately half of his adult height. At 3 years, he is an immature adult, with many of his emotional patterns set for life.

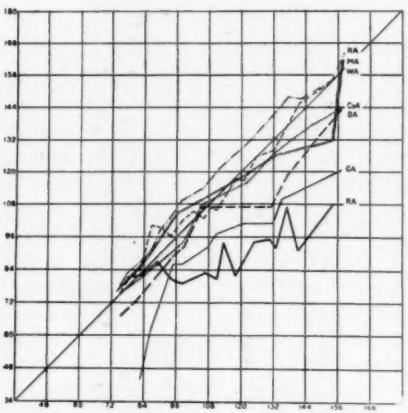

Fig. 1.—Retarded and split growth in boy with uniformly serious problem tendencies. The curves HA, height age, MA, mental age, WA, weight age, CaA, carpal age, DA, dental age, GA, grip age, and RA, reading age are plotted against the chronologic age line. This 13-year-old boy, as far as development is concerned, is almost two opposed individuals in one. (Courtesy of W. C. Olsen and B. O. Hughes, Child Development Laboratories, University of Michigan.)

Many dentists are glad to learn that they can expect the preschool patient to pay a first visit with a profound and mature curiosity, but with a vast inexperience in the procedures of the dental office. Often, they are surprised to learn that technics of approach to the small patient can be worked out to deal with his curiosity, not above, not below, but on his level of social maturity. They are surprised further to learn that a partially satisfied curiosity and a gradual accumulation of dental experiences afford an accurate reflection, as early as at 3 years, of good office behavior thirty years hence.

Most operators are interested to learn that growth, including dental growth, is intimately associated with behavior. An orthodontist, an anthropologist, a psychologist and an elementary-school principal at the University of Michigan have combined to make rather startling pro-

Fig. 2.—Facial appearance in case of congenital syphilis.

nouncements about behavior and growth. Their research permits the principal[5] to pick teacher's bad boy student or the dentist's bad girl patient by the study of plotted curves of achievement and development. Against a background of chronologic age (Fig. 1), carpal age, grip age, dental age, weight age, height age, reading-ability age and mental age are plotted. With 90+ per cent accuracy, the individual, while he is absent, is picked as a problem child on the basis of his retarded or split growth pattern. This concept of misbehavior as a product

of physical maldevelopment lends zest to practice for children and tends to soften the operator's irritation over poor performance in the dental chair.

Another attitude the value of which the orthodontist can demonstrate to the operative dentist is a wider interest in the health of young patients. Dentists are occasionally astonished by the gait of the patient as he walks into the operating room. Alert dentists see suspicious symptoms in unusual postures, head shapes and facial and oral conditions, enlargement of cervical glands and deformation of the extremities. The suspicion of an abnormal condition and the referral of the patient to the pediatrician on the basis of that suspicion will enlarge the

Fig. 3.—Teeth of congenital syphilitic.

sphere of the health service of the children's dentist and make a contribution, perhaps, to a sturdier race.

For example, the symptoms of congenital syphilis in Figures 2 and 3 are readily recognizable. The appearance of the 11-year-old girl in Figure 4 is one of emaciation and loss of tone. Her appearance and the fact that she had inflamed gums and definitely movable teeth led to referral to a physician, who made the diagnosis of diabetes mellitus. The roentgenograms in Figure 5 appear to be those of a 4-year-old child, but the patient, a boy, 43 inches tall, weighing 37 pounds, alert and highly intelligent and very susceptible to respiratory infections, was 7 years and 3 months of age. On referral by a dentist who was curious regarding the condition, physicians were able to determine that the lack of physical development was due to a congenital circulatory condition resulting from patency of the *ductus arteriosus*.

The roentgenograms in Figure 6 likewise appear to be those of a 4-year-old child. In this instance, the patient was an 8-year-old boy, short, squat, fat and irritable and, according to his teacher, at the foot of his class. Physicians de-

Fig. 4.—Diabetic girl, aged 11.

cided that a basal metabolic rate of −21 indicated a hypothyroid condition and treated him accordingly.

The dentist must exercise caution not to abruptly diagnose all delayed dentition as the result of a hypothyroid condition. Figure 7 shows roentgenograms of the four posterior segments of a jaw in which one can count nine deciduous teeth. The patient was a 15-year-old high school girl who had a normal thyroid condition and who had matured

early. She was taking the lead in the high school play and ranked second in scholarship in her class. Prompt eruption of all but the left maxillary cuspid followed the immediate extraction of the nine deciduous teeth. Routine roentgenograms of a 17-year-old high school senior, 6 feet 3 inches tall and star tackle on the football team, disclosed a retained maxillary second deciduous molar and its impacted successor. (Fig. 8.) Extraction of the retained molar and curettement of some overhanging bone led to complete eruption of the second bicuspid in a period of fifteen months. Delayed

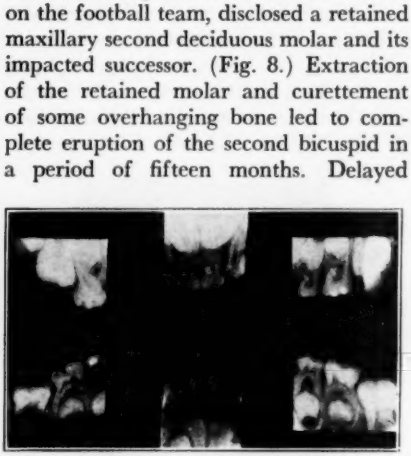

Fig. 5.—Tooth development in boy, aged 7 years 3 months, who had patent ductus arteriosus.

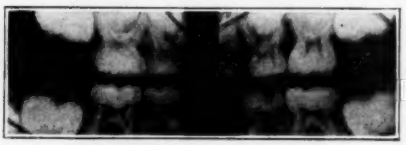

Fig. 6.—Dentition of boy, aged 8, who had a hypothyroid condition. No permanent teeth had erupted.

dentition in this instance could not be ascribed to hypofunctioning endocrine glands.

Probably one of the most frequent puzzles which confront the operative dentist is the selection of procedures for handling the anomalies which appear frequently in the dentition of young patients. The counsel of the cooperative orthodontist in this area of growth problems can scarcely fail to result in more rational procedure on the part of the operative dentist.

The anomaly which most frequently annoys the operative dentist is the absence of a bicuspid, apparently the result of a familial tendency.[6] Certain operative considerations are involved, as well as certain considerations of diagnosis. Frequently, in accordance, of course, with the age, condition and occlusion, the orthodontist will advise the

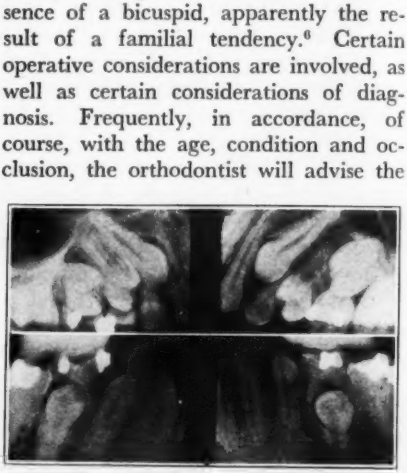

Fig. 7.—Dentition of girl, aged 15, of normal physical development except for retention of nine deciduous teeth.

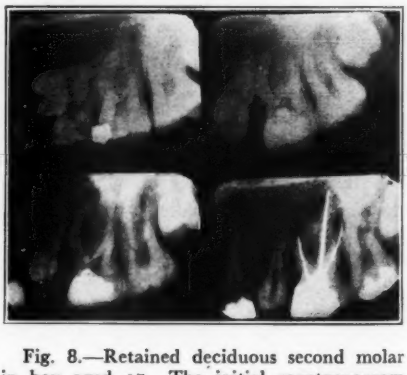

Fig. 8.—Retained deciduous second molar in boy aged 17. The initial roentgenogram was taken February 14, 1938, and the final one May 20, 1939.

filling of cavities, sometimes with a decrease in the mesiodistal diameter of the tooth, and the preservation of the deciduous molar.

Fused deciduous teeth occasionally present a developmental problem for co-

operative consideration. The lateral and central incisors or the cuspid and lateral incisor are the teeth most frequently involved. Anterior roentgenograms help in planning procedure. One or the other of the succeeding teeth is frequently absent (Figure 9), although both permanent tooth buds may develop. (Fig. 10.) The question when to extract and what to do afterwards always arises.

If the dentist resorts frequently to posterior interdental roentgenograms in children's practice, he may be surprised at the number of first permanent molars found so wedged under the distal convexity of the second deciduous molar that they cannot completely erupt. Lewis[7] has called this condition an ectopic eruption of the first permanent molar.

Fig. 9.—Fused deciduous central and lateral incisors in preschool child. The permanent lateral incisor is missing.

Even after considerable resorption of the deciduous roots from pressure exerted by the permanent molar, separation can be secured with a loop of one or more strands of 22-gage brass ligature wire, and the permanent molar can be permitted to complete eruption. (Fig. 11.) Sometimes, the second deciduous molar is completely pushed out and considerable space is lost.

In some instances (Fig. 12), an annoying problem arises when deciduous molars appear to become ankylosed to the alveolar bone and fail to maintain the level of the occlusion of the remaining teeth. They present the appearance of teeth which have been depressed into the tissues of the jaw, and they become almost useless as far as function is concerned. Usually, the indicated procedure is extraction if they do not exfoliate naturally and at the normal time. In one instance of multiple missing permanent teeth, twenty-six in all, including all but two of the molars, cast onlay crowns were utilized to build all four lower deciduous molars into occlusion, to provide a masticating area for the patient.

Completely submerged or unerupted deciduous molars are removed when detected, particularly if attempts to lance through the soft tissue to the occlusal surface have failed to cause their eruption, but have left a communication to

Fig. 10.—Fused deciduous lateral incisor and cuspid in 8-year-old boy. Both permanent teeth have developed.

the crown which permits caries to develop. Figure 13 shows the unerupted second deciduous molar of a 5-year-old girl. Caries can be noted in its occlusal surface and the crown of the second bicuspid will be seen lying between the distal root of the deciduous molar and the mesial surface of the crown of the first permanent molar. A space maintainer was placed immediately after removal of the second deciduous molar, with double cast onlay crowns in one piece on the cuspid and first deciduous molar and an L-shaped bar which extended back into the extraction wound

to rest against the mesial surface of the unerupted permanent molar.

A practice that the orthodontist should impress on the operative dentist is routine examination of the teeth in occlusion; for unless the child's teeth are examined in occlusion, many a mesial or distal relation of the mandible to the maxilla, and nearly all posterior crossbites, will go undetected by the operative dentist. Most dentists were taught as undergraduate students to examine the relationship of the maxillary to the mandibular first permanent molar with the patient's teeth in occlusion. The dentist

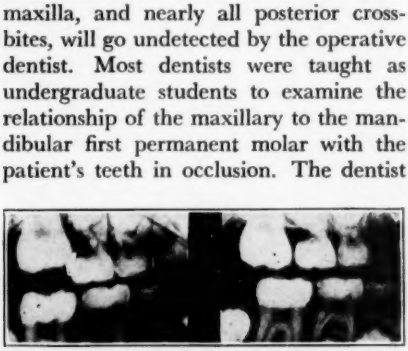

Fig. 11.—Left: Use of brass ligature wire to separate deciduous second molar and partially impacted first permanent molar in a child aged 8. In the roentgenogram to the right, taken three weeks later, the first permanent molar is fully erupted.

Fig. 12.—"Submerging" deciduous molar in child aged 8.

has been taught to conclude that if the mesiobuccal cusp of the maxillary first permanent molar occludes in the buccal groove of the mandibular molar, all is well with the posterior occlusion of the maxillary and mandibular arches. Immediately the operator examines the occlusion of the preschool patient, however, he finds that these familiar landmarks are missing. The cooperative orthodontist may suggest to the operative dentist that he follow Friel's chart of deciduous occlusion[8] and note the relationship of the distal surfaces of the corresponding maxillary and mandibular second deciduous molars. If these surfaces occlude in approximately a single plane (Fig. 14), the examiner may conclude that all is well with the posterior relationship of the arches.

Another group of puzzles develop for the conscientious operative dentist in the anterior segments of the deciduous

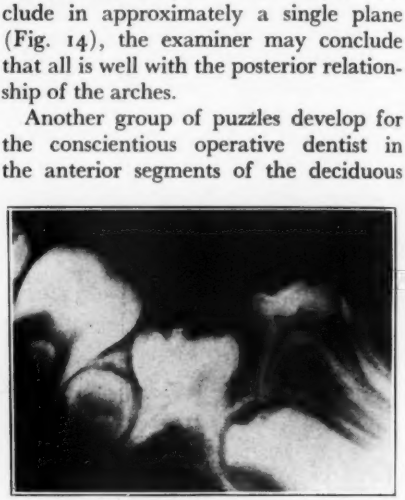

Fig. 13.—Unerupted deciduous second molar in girl aged 5.

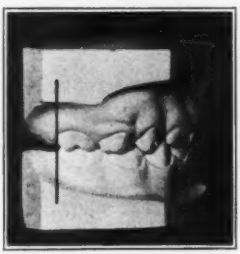

Fig. 14.—Normal molar occlusion in child of preschool age.

arches. For example, many children from $4\frac{1}{2}$ to 6 years of age come to dental offices with well-spaced deciduous incisors, but a number of children show no spacing whatever. Most operators would like to know whether a child will have crowded permanent incisors if space does not develop. Perhaps three suggestions of the orthodontist may prove helpful: Examine the occlusion to determine

whether the posterior occlusion of the two arches is satisfactory; find out whether the alinement of the anterior teeth of both parents is satisfactory, and make casts to record the present occlusion of the patient. The future development of the arches as the six anterior teeth erupt can then be checked against these casts. Figure 15 shows an arch with crowded incisors at 6½ years which developed excellent occlusion by 14½ years without resort to appliances. In any case of this kind, observation is indicated.

It is interesting to note, in this particular instance, that the dentist did not yield to the urgent demand of the mother

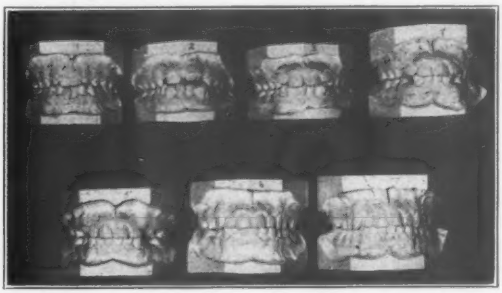

Fig. 15.—Case of crowded incisors at 6½ years that developed excellent anterior arch occlusion at 14½ years.

of the patient that the deciduous central and lateral incisors be removed to make room for the large permanent central incisor; and the deciduous cuspid, in turn, to make room for the permanent lateral incisor. Such a procedure, one may conclude, invariably disregards the function of each anterior tooth to retain space for its successor and to serve at the same time as a buffer against which the adjacent erupting permanent tooth can exert a force causing much needed lateral expansion of the arch.

A somewhat similar question which arises to annoy the operative dentist is the procedure to be adopted when accident or infection causes early loss of deciduous incisors. Should a space-maintaining appliance be used? To date, I have not observed an instance of early loss of the deciduous incisors in which space was lost or an appliance was required in the maxillary arch. The maxillary anterior teeth occluding, as they do normally, labially to the mandibular anterior teeth, find a natural splint in the lower arch to maintain the proper space in the upper arch. At the same time, the tendency to lateral expansion is increased by the development of the much larger permanent incisors. In the lower arch, however, the operator is confronted by a different situation. The normal overlap of the upper teeth serves to make them exert a constant pressure to close a space in the anterior segment of the deciduous lower arch.

Probably one dental condition in children excites in parents as much as or more worry than any other condition that has to do with appearance, a space between the young maxillary permanent central incisors. Much disagreement can be noted in past orthodontic literature concerning the diagnosis of the abnormal *frenum labii superioris* and its relation to spaced central incisors. Some orthodontists have maintained that there is such a condition as the abnormal frenum and that such a frenum should be removed surgically. Other orthodontists have maintained just as stoutly that no frenum exists which the pinching pres-

sure of the central incisors will not cause to atrophy. The conclusions of Coleman,[9] based on a study of more than 2,000 casts made at various periods in the development of a group of children, provide some reassurance to the operative dentist who has not known what procedure to adopt. Coleman concludes, "Although a continuous frenum exists in early life, it practically always recedes later under physiologic lateral pressure incident to the eruption of the permanent lateral incisors and canines." Figure 16 shows a cast with a deep depression between the central incisors, accompanied by a large cordlike frenum at 6½ years, and the closed diastema at 10½ years. No appliance or operation was utilized for this patient.

Fig. 16.—Diastema with thickened cordlike frenum at 6½ years (left) which closed without treatment by 10½ years (right).

Fig. 17.—Irregular maxillary incisors, evident when mouth is open. (Compare Figure 18.)

The alert operative dentist sometimes is similarly puzzled to know what advice to offer when he notes a short *frenum linguae* which causes an apparent tonguetie in a very young patient. Again, it may prove reassuring to learn that McEnery and Gaines[10] report, from a study of 1,000 patients in Children's Memorial Hospital Speech Clinic, Chicago, that only four have been handicapped because of seriously shortened frenums. These investigators caution that careless clipping of the *frenum linguae* may result at times in severe hemorrhage, a spreading stomatitis or immobilization of the tongue by scar tissue.

In the open-mouth examination of the child patient, the operative dentist will often note irregular incisors (Fig. 17) and wonder why this condition exists when there is sufficient space to accommodate these teeth. Immediately the teeth are closed in occlusion (Fig. 18), an obvious incisor cross-bite presents itself. The use of carefully trimmed tongue blades, with instructions to patients as to how to bite on the blades, has freed lingually locked erupting anterior teeth within the period of one week.

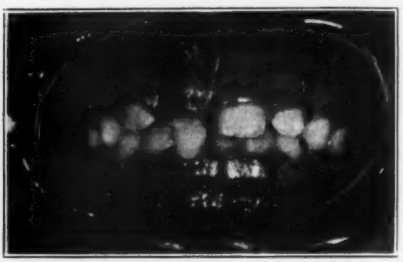

Fig. 18.—Incisor cross-bite evident when mouth is closed. (Compare Figure 17.)

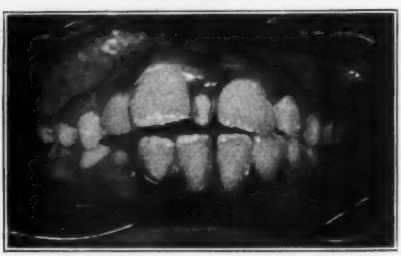

Fig. 19.—Midline supernumerary in boy aged 10.

Another entire group of deviations in the occlusion of the anterior segments of children's arches go undetected in the open-mouth examination. This group consists of the deviations produced by mouth habits: thumb sucking, finger biting, tongue biting or thrusting, fingernail biting and lip biting. The operator who has failed to make examinations routinely of children with the teeth in occlusion is bound to be amazed at the high percentage of children who have mouth habits, and the difficulty, on occasion, of diagnosing and breaking a habit. Here is another opportunity for cooperation with the orthodontist.

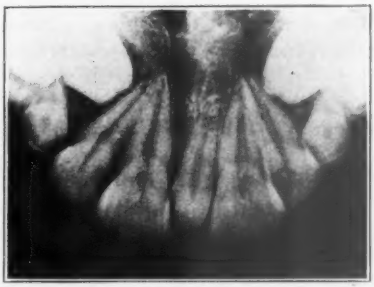

Fig. 20.—Anterior view revealing well-formed cuspid-like supernumerary.

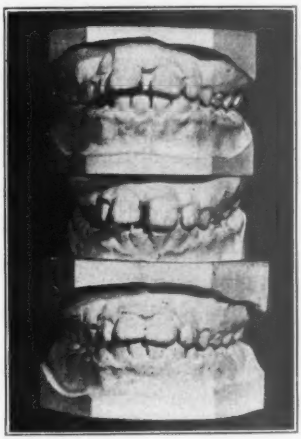

Fig. 21.—Casts showing 1.5 mm. closure of space between maxillary central incisors one week after removal of supernumerary. In one year, close contact of the central incisors resulted.

One of the anomalies of dentition which appear frequently to add to the operative dentist's problems in the anterior area of children's arches is the midline supernumerary tooth. Figure 19 shows a typical instance in a 10-year-old boy. An anterior occlusal roentgenogram (Fig. 20) showed a well-formed, cuspid-like supernumerary tooth. One week after the removal of the supernumerary, the space between the central incisors had closed 1.3 mm. In one year, dental floss could be snapped between the proximal contact point of the two central incisors. (Fig. 21.)

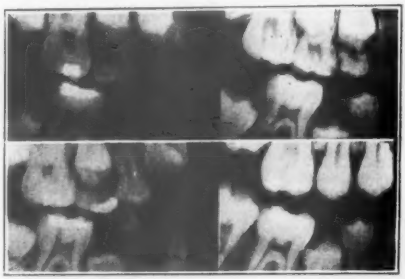

Fig. 22.—Case in which space created by early loss of deciduous second molar closed and later reopened to permit eruption of second bicuspid. Above, left, case at 8 years 4 months. Below, right, case at 11 years 3 months.

Fig. 23.—Drifting of first permanent molar anteriorly into definite malposition, in child aged 7 years 7 months. At 9 years 3 months, early eruption of the second bicuspid pushed the molar posteriorly into an end-to-end relationship with the lower first molar.

A right deciduous lateral incisor in a girl 2 years and 9 months old did not erupt until, under general anesthesia, the

gum tissue was incised and the bone around the crown was curetted away. The parents of a 5½-year-old boy were embarrassed about his "pygmy" mandibular deciduous incisors until roentgenograms showed their successors to be normal in size. The treatment of other anomalies in the anterior segments of the arches, such as missing lateral incisors, peg lateral incisors, malformed central incisors, impacted cuspids, odontomas, twinned teeth, transposed teeth and teeth malalined owing to cleft palate, present problems which can best be

Fig. 24.—Migration of posterior teeth anteriorly to fill space created by distoclusal cavity in deciduous first molar in child aged 9.

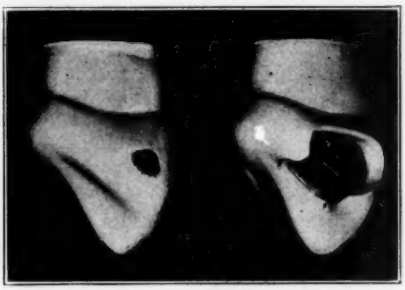

Fig. 25.—Distolingual cavity preparation designed to restore distal contact point of deciduous cuspid adequately with silver amalgam.

solved by cooperation of the children's dentist with the orthodontist and, not infrequently, the oral surgeon.

As has been stated earlier, the cooperative orthodontist has an unusual opportunity, and perhaps the responsibility, of teaching operative dentistry for children in all of the phases of a children's practice which involve growth and development. One of the problems on which the operator would appreciate some unanimity of opinion concerns the desirability of the use of maintaining appliances in the spaces created by early loss of deciduous molars, and the type of construction to be utilized.

The investigations of Lewis and Lehman[11] and others more recently have called attention to differences in the lateral growth of the various segments of children's arches. For example, a rather startling increase in lateral dimension may be noted in the maxillary cuspid region as compared to the widening of the arch in the region of the maxillary second deciduous molar during the same period of growth. These growth variations should be called to the attention of the operator so that he will not construct a space-maintaining appliance which interferes with the lateral migration of

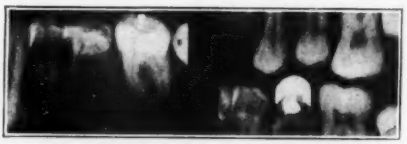

Fig. 26.—Retained deciduous second molar in boy aged 13, which has been trimmed to bicuspid dimensions and restored by "onlay" crown because of congenital absence of second bicuspid.

teeth or which locks a tooth in position so that it rotates on its axis.

Dentists have wondered at times if a space maintainer should provide for a possible widening of the space created by the early loss of a deciduous molar. Friel[8] answered this question when he called attention to the fact that the average combined mesiodistal diameter of the maxillary deciduous cuspid and first and second deciduous molar is 1 mm. greater than that of their successors, while a 2 mm. difference exists similarly for the mandibular teeth. This difference is much more startling if the diameter of the two deciduous molars alone is compared with that of the replacing bicus-

pids. Obviously, unless the space has closed previously (in which instance, space maintenance would be of doubtful value), the dentist can cease to worry about its increase when he plans an appliance.

Other questions which the operative dentist would like to have answered concern function in the space-maintaining appliance. Is the restoration of function essential? Will the elongation of unopposed deciduous molars produce a permanent malocclusion?

Other questions which arise are, "What design shall be used to prevent caries of the abutment teeth, and what design can be utilized to obviate frequent recementing?"

The final question to arise is, "Can space maintenance be justified at any time in the spaces created by the early loss of deciduous molars?" Observations appear to make a case for the use of a space-maintaining device when the second deciduous molar is lost before the eruption of the first permanent molar, but its use in the case of the first deciduous molar space is not so readily justified. A recent report of a study by Cohen,[12] begun in 1926 at the Institute of Child Welfare at the University of Minnesota on 156 preschool children, shows that 40 per cent of the fifteen cases of early loss of the second deciduous molars resulted in malocclusion of the permanent teeth, but only 6 per cent (one case) of the eighteen cases of premature loss of the first deciduous molar resulted similarly.

When such information is coupled with the observation of an anthropologist[6] that children tend to follow the growth pattern which they inherit regardless of the early loss of deciduous teeth, the operative dentist becomes willing to follow the orthodontist's advice: (1) take a snap impression immediately after the deciduous molar is extracted; (2) make a cast to record the space; (3) make frequent measurements of the space in reference to the cast, and (4) construct a space maintainer if the space appears to be closing rapidly toward a dimension which will be less than that required for the succeeding permanent tooth. Figure 22 presents an illustration of the anthropologist's viewpoint. The patient, a girl 8 years and 4 months old, lost a second deciduous molar, and the space closed and then reopened owing to the stimulation of the erupting bicuspid. Both her younger sister (Fig. 23) and her older brother lost second deciduous molars without a resultant malocclusion of the permanent successors. Both parents of this family have full, round, well-developed arches.

Still other operative indications can be stressed by the orthodontist. The orthodontist, owing to his routine use of roentgenograms in diagnosis, acquires an excellent background from which to point out to the operative dentist the value of roentgenograms in the early detection of proximal caries, of the presence of root fragments and of developmental anomalies which may interfere with occlusion. From the standpoint of occlusion, similarly, he has considerable evidence on which to base a plea for carefully contoured and finished restorations. Failure to restore the complete mesiodistal diameter of the deciduous molars when they are filled can lead to the loss of needed space. Failure to restore the distal cavities in deciduous cuspids adequately with metal fillings may mean the loss of a contact which is required for lateral arch development. Failure to carefully trim off gingival overhangs on metallic fillings in deciduous molars may interfere with the eruption of the adjacent bicuspid. Figure 24 shows the anterior crowding of the posterior teeth which may occur when the restoration of molar proximal cavities is delayed. Figure 25 shows a distolingual cavity preparation for the deciduous

cuspid which, combined with the use of a matrix, restores the distal contact point adequately with silver amalgam.

The overlong retention of deciduous molars is often called to the attention of the operator, since it may contribute to malocclusion in two ways; namely, a crowding of the arch due to the retention of an undue amount of space, or a rotation of a bicuspid due to the occlusion of the sharp cusps of the bicuspid against the broad, flat occlusal surface of the opposing deciduous molar. Judicious extraction in such instances may contribute something to prevention of an impending malocclusion.

Overlong retention of the deciduous molar may be handled in congenital absence of the bicuspid by trimming down the bellshaped deciduous molar and constructing a cast bicuspid-like crown. In some instances, the devitalization of the molar may be necessary in order to reduce the mesiodistal diameter. (Fig. 26.)

SUMMARY

Numerous refinements in the practice of dentistry for children are possible when the orthodontist and operative dentist cooperate in the management of conditions which may affect the growth and development of the dental arches of child patients. It has been pointed out that such cooperation may be furthered in the following phases: (1) behavior management; (2) physical diagnosis; (3) management of anomalies of dentition; (4) examination of occlusion; (5) observation and treatment of deviations in the arrangement of the teeth in the anterior segments of children's arches and (6) practice of more adequate operative dentistry.

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THE INDIVIDUAL UNIT PORCELAIN BRIDGE

By CARLISLE C. BASTIAN, D.D.S., New York, N. Y.

WHAT we usually consider an individual unit porcelain bridge is one the abutments of which are porcelain jackets on vital teeth, with individual porcelain teeth as dummies, and with each porcelain unit cemented to a metal framework. The stresses of the bridge are borne by the gold skeleton, the porcelain merely taking the strain of individual crowns. On the other hand, the reinforced all-porcelain bridge is built on an iridioplatinum skeleton and finally glazed as a single unit.

Porcelain bridgework is by no means new. The designs today may be modern, but the basic principle is old. In earlier practice, the all-porcelain bridge was constructed with devitalized teeth as abutments. It was considered not only advisable, but also essential to devitalize perfectly sound teeth before using them as abutments for bridgework. The common technic of construction called for heavy iridioplatinum post wire in the root canals, platinum copings over the root ends and abutments joined with heavy iridioplatinum wire. Appropriate platinum pin teeth were then soldered to the iridioplatinum bar and the desired contours restored with baked porcelain.

Within the recollection of some of us, many of these bridges failed, owing to breakage of the porcelain. When this happened, the bridge had to be remade. Inasmuch as heavy posts were cemented in the root canals, it was a difficult undertaking to remove the bridge from the mouth. The operator sometimes anticipated the possible breakage of the porcelain by setting these bridges with base-plate guttapercha instead of cement. If breakage occurred in the porcelain, it was simple to remove the bridge by the application of heat. However, if the bridge had been in the mouth for some time, the guttapercha would have a bad odor, and so the problem was not successfully met in this manner.

"When Taggart presented his casting technique in 1906, the all-porcelain bridge was discarded to some extent, and the individual unit bridge used in its place. Instead of the porcelain bridge being a one-piece unit, individual ready-made porcelain crowns were used and adapted with casting wax for the making of a gold casting. Thus a bridge was constructed somewhat similar to the present day individual unit bridge, using, however, post crowns and devitalized teeth for the abutments."

With the condemnation of devitalized teeth for bridge abutments, the dowel crowns began to be discarded. The growing interest in pulp conservation led to the development, as a substitute, of the porcelain jacket crown for porcelain bridgework. Experience demonstrated the success of the porcelain jacket as an abutment where only one end of the bridge was cemented and the other end merely rested on the adjoining tooth. Thus it was and still is extremely successful for replacing a single missing tooth.

Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 28, 1941.

Where, however, cemented jackets were employed as abutments at both ends, the percentage of breakage was so high that this type of bridge was almost wholly abandoned. This led to the reinforcement of the all-porcelain bridge with a metal skeleton.

Thus we have now returned to the making of porcelain bridges somewhat similar to those of, say, thirty-five years ago, with the essential difference to which reference has already been made; namely, that the abutment teeth are not devitalized. We have already noted the two types—the reinforced all-porcelain bridge and the individual unit porcelain bridge. There is a considerable difference of opinion as to which type is the more practical. It is my clinical experience that the individual unit bridge is the one to be preferred, mainly for the reason that should the porcelain break, the bridge can be repaired without removal.

Fig. 1.—Stone model with copper dies for gold shoulder porcelain jacket abutments.

Fig. 2.—Fusible metal caps and saddle tray in three parts. The three are united and used to obtain a corrected impression of the saddle area.

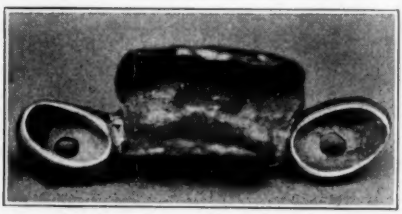

Fig. 3.—Fusible metal caps and saddle tray with corrected impression obtained by adding low-fusing compound and wax.

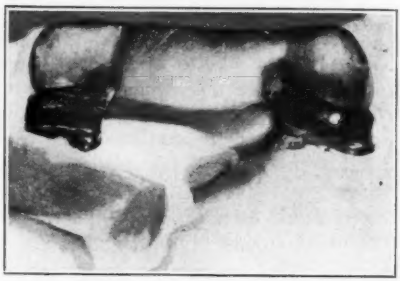

Fig. 4.—Saddle area cut away and stone repacked against corrected impression.

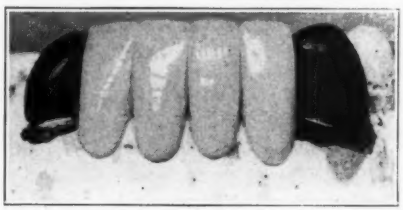

Fig. 5.—Four anterior pontics and wax jackets to obtain correct alinement before making porcelain jackets.

Fig. 6.—Metal portion of the abutments. Hard gold has been cast on to one one-thousandth platinum.

Compared with this ease of repair, the breakage of a one-piece platinum and porcelain bridge is a calamity. It is usually necessary to make a temporary partial denture and then an entirely new

bridge. In the case of the gold and porcelain bridge, if one of the porcelain units should break, temporary replacement can be effected with silicate cement. The final repair can then be made by taking an impression without disturbing the bridge in the mouth, and completing and cementing the individual unit.

It is difficult to determine the percentage of breakage of porcelain bridges. Ex-

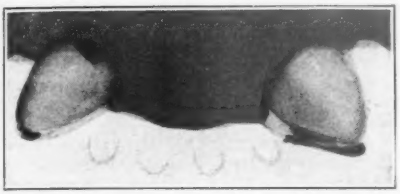

Fig. 7.—Gold and porcelain abutments finished and placed in position on copper dies.

Fig. 8.—Thirty-four-gage platinum burnished and swaged over saddle area.

Fig. 9.—Abutments, pontics and platinum saddle held in position by plaster wall. The case is waxed and ready for the casting.

perience shows that the greater the care in design and construction, and the more favorable the conditions, the lower the percentage of breakage. However, porcelain is still the same friable material. It is well known that during the many years that we have been using porcelain for no matter what type of work, there has been a certain percentage of breakage. Therefore, with fixed bridgework, the object has been to have the porcelain replaceable.

Also, with the individual unit bridge, it is possible to secure a more lifelike structure for each unit of the bridge. With the one-piece bridge, there is always the difficulty of retaining the individuality of the separate teeth.

As regards the relative merits of iridioplatinum and gold alloy for the skeleton,

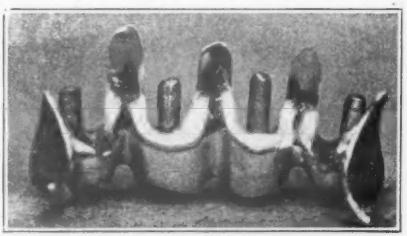

Fig. 10.—Completed casting.

Fig. 11.—Overlap used between casting and each abutment to give strong solder joint.

it is claimed that some gold alloys are equal or possibly superior to iridioplatinum for this use, although, to my mind, both are satisfactory. The gold alloy, however, should be carefully selected as to both strength and stiffness, for it must take the entire stress of the bridge.

One advantage claimed for the porcelain and platinum bridge over the individual unit bridge is that the former is

constructed with porcelain saddles. While it is possible in some cases to have porcelain saddles on a porcelain and gold bridge, it is more practical to use gold or platinum. Clinical observation has, I believe, demonstrated to the profession that the soft tissue of the mouth remains just as healthy in apposition with a properly constructed platinum saddle as it does against a porcelain saddle. Here again, we are not introducing anything new to dentistry. Saddles for fixed bridgework have been used for many years. In the past, numerous writers have warned of the necessity of selecting the cases and of the need for extreme care in the technic of construction.

For example, Goslee in his book, "Principles and Practice of Crown and Bridge Work" published in 1907, says of saddles for fixed bridgework:

A saddle must fit the tissue perfectly and must rest upon it with uniform pressure at all points, yet not sufficiently hard to cause capillary stasis, or to induce resorption. The edges should be rounded and smooth so as to exert no possible irritating influence. It should be made of a metal which is least susceptible to the chemical action of the secretions. For this reason the use of platinum is universally indicated.

When this was written, removable bridgework had not been perfected to its present high degree. Today, we are all probably prepared to admit that, in making fixed saddle bridges, we are sacrificing the perfect cleanliness of the removable saddle bridge. At the same time, it can well be contended that while the ideal hygienic result cannot be obtained with a fixed saddle bridge, a perfectly practical result is possible by following a careful technic in the design, fit and finish of the saddles, whether they are constructed of porcelain or of platinum.

Many methods have been advocated for securing the correct relation of the saddle to the gum tissue. A most exact technic is necessary for fixed saddle bridges because no adjustment is possible after cementation. A common practice is to cut the stone model according to the ideas of the technician in an effort to secure a certain amount of compression of the soft tissues. Naturally, this is a hit-or-miss method. I suggest a temporary fusible metal saddle, fitting the saddle area of the working model. This saddle should be united to fusible metal caps fitting the copper or amalgam dies of the same working model. The saddle should be relined with low-fusing modeling compound and tried repeatedly in the mouth to obtain a slight, but uniform compression of the soft tissues. The saddle area of the working model is then cut away and fresh stone packed against the modeling compound. In this way, a close adaptation of the final saddle can be secured without overcompression.

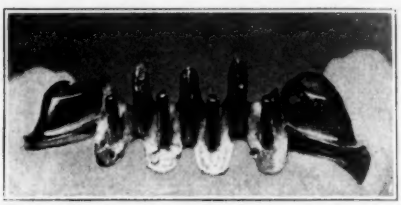

Fig. 12.—Assembled framework.

Fig. 13.—Completed bridge.

The accompanying illustrations present a technic for the construction of the individual unit bridge. The first step, after the making of study models and roentgenograms, is the preparation of the abutment teeth. In the anterior part of the mouth, it is invariably necessary to make a shoulder preparation and, if possible, to cut a liberal shoulder into the

tooth in order to provide sufficient room for both the inner gold cap and the porcelain of the jacket. In the posterior part of the mouth or in the lower incisor region, where it is permissible to show a little gold at the gingival border of the tooth, I prefer a shoulderless preparation, which permits the conservation of tooth structure and a greater safety of the pulp.

The illustrations cover the making of a lower anterior bridge with a shoulderless preparation; also an upper anterior bridge, using a shoulder preparation.

22 Central Park South.

VARIATIONS IN CALCIFICATION AND ERUPTION OF THE DECIDUOUS AND THE PERMANENT TEETH

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ALL dentists—in general practice or in special practice—should consider the two developmental phases of calcification and eruption of the teeth and should recognize the problems associated with variations of these two phases, if an adequate diagnosis and prognosis are to be made for every growing child patient. This study is primarily concerned with the problems associated with variations in both the deciduous and the permanent teeth. The entire future of the dental pattern in growth and development, function and esthetics is involved in many of the questions concerning the calcification and eruption of the two dentitions.

Members of the dental profession have no alternative but to assume the responsibilities that are theirs. Many patients' lives have been and will be influenced by the interest that the dentist manifests in these developmental phases. Facial and dental arch forms, as well as alinement of teeth, change the careers of many persons, and some failures in business can be attributed to a poor appearance associated with the teeth and oral structures.

A knowledge of growth and development, calcification and eruption, as related to the average and normal, is necessary to arrive at a justifiable plan of treatment for a growing patient. In addition to knowing the average and what is considered normal, it is important to know about the possible factors in variations from the average. There is little doubt that heredity, environment, endocrine reactions and nutrition all play a part in the calcification and the eruption of the teeth.

METHODS OF DETERMINING PHYSIOLOGIC AGE

A number of investigators, including Bean,[1] Beik[2] and Cattell,[3] have, for some time, estimated the dental age and, in a sense, the physiologic age of the patient by the eruption of the teeth. Although this appears to be more dependable than some other methods for estimating dental and physiologic age, it does not present the entire picture of the developmental process of the dentition. An eruption reading shows only the number of teeth in the oral cavity, with no indication of probable congenital absence of

From the Department of Preventive Dentistry and Pedodontics, College of Dentistry, State University of Iowa.

teeth or the state of calcification of the developing teeth within the alveolar arches. It also does not indicate the length of roots of the erupted teeth or the extent of resorption and eruption within the jaw bones.

The dental and physiologic age could be determined much more accurately if all of the foregoing factors were considered. The roentgenogram would certainly be essential for such a determination, since, in all problems of eruption, there are many factors which are visible only through use of the roentgen rays.

If all of the factors in calcification and eruption are considered, dental age may well be used as a criterion for physiologic age. Numerous methods have been used to determine the relative physiologic age. Todd's[4] work on skeletal maturation as evidenced by osseous development in the hand has been most frequently referred to, particularly in orthodontics. Prescott[5] and others have made notable contributions in the study of bone development.

Height, weight and length measurements of various parts of the body have been used to a great extent to determine maturation levels of the growing child. One of the greatest problems is to find an acceptable definition of what is to be considered normal.

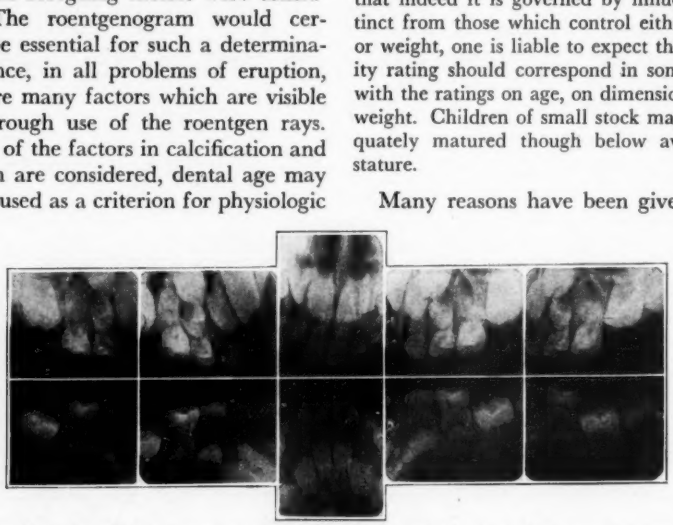

Fig. 1.—Case, in girl aged 5 years and 4 months, in which chronologic age corresponds with average for calcification and eruption as shown in chart.

VARIATIONS IN GROWTH AND DEVELOPMENT

It is generally agreed that growth and development may vary considerably and still be within the realm of normal.[6, 7, 8, 9] It is agreed, too, that the rate of growth varies between the sexes.[10] Todd[4] writes:

> Until one realizes that maturity status does not correspond with stature or with weight and does not necessarily correspond with age, that indeed it is governed by influences distinct from those which control either stature or weight, one is liable to expect that maturity rating should correspond in some degree with the ratings on age, on dimension and on weight. Children of small stock may be adequately matured though below average in stature.

Many reasons have been given in literature for a marked difference or variation in growth and development. A publication of the Children's Bureau[11] says,

> The child's well being is dependent not only on his present condition but also on his previous history (familial, antenatal and postnatal). Together they determine his ability to compensate for or overcome his present defects and handicaps, and his future incapacities as well.

This article and Barborka's[12] refer to great variances in nutrition as one of the principal reasons for difference in maturity and development which presents many subclinical symptoms and many associated problems. This same thought has been presented by Speidel and Stearns,[13] as well as Elliott,[14] of the Con-

sumers Commission for National Defense.

In a study of growth and development, one may conclude that there is a considerable range in which a child may be termed normal and be within the bounds of average. Further, it must be conceded that there are many different factors in the variations in children considered normal.

With such differences evident and agreed upon by the authorities in the field of growth and development, it would be natural to assume that an equal or like variation exists in the calcification and eruption of the teeth. Growth and development of the teeth are controlled by the same biologic laws and principles as any other part of the body. The same blood, minerals, vitamins and endocrine products that supply the heart or any other vital organ also will be directed to the teeth and their surrounding structures. Thus, variations which will not necessarily correspond to a given chronologic age are to be expected in the calcification and eruption of the teeth.

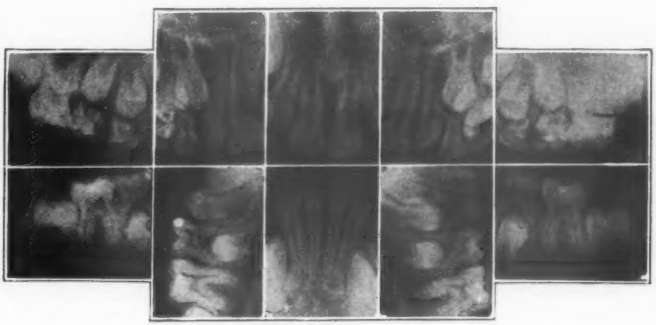

Fig. 2.—Case, in girl aged 7 years and 6 months, in which calcification age is 9 years and eruption schedule average.

DATA AVAILABLE ON THE CALCIFICATION AND ERUPTION OF THE DECIDUOUS AND PERMANENT TEETH

That there is considerable variation in growth and development of the teeth has been recognized by many prominent writers. Hellman[10] says,

> The process of dentition is a physiological manifestation, and as such it has to be established on the basis of variation. In the digression from the normal in the process of dentition, differences in age, differences in length of period and differences in order of succession in the eruption and shedding of the teeth must be distinguished.

He refers to the finding that differences are intimately related to frequency of malocclusion. Klein and Cody,[15] of the United States Public Health Service, agree with Hellman, as does Anderson,[16] who is co-author of the textbook, "Practical Orthodontia."

A number of research workers have developed tables and charts to indicate the averages for eruption and calcification of the deciduous and the permanent dentition. The most recent of these is the work of Schour and Massler,[17] in their well designed and practical chart entitled "Development of the Human Dentition," which is intended to depict the averages for the various age levels from 5 months *in utero* to the completion of the adult dentition. These authors[18] say,

> The growth of the enamel and dentin is much less affected by systemic disturbances than is growth in the facial skeleton. The eruption of the teeth is usually disturbed to

a greater degree than is the growth of the enamel and dentin, but less than the growth of the facial skeleton.

Schour and Massler thus appreciate the clinical problems associated with dentistry as related to the growing child, and fully realize that, in their chart, they are dealing with the average patient of a given age. It was their desire to establish certain acceptable norms which practitioners could use in determining the relative status of their patients. The chart was not intended to be, and could not be, an absolute guide in the determination of all clinical problems. However, one must recognize and understand the average and normal, and thereon base the diagnosis and prognosis of the individual case in the event of variables. The clinical application of the information at hand is the next important issue.

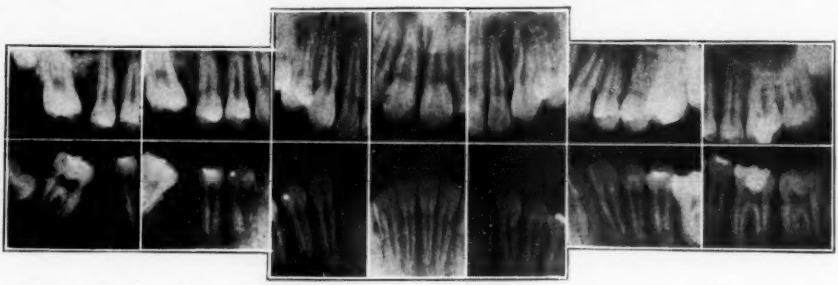

Fig. 3.—Case, in boy aged 9 years and 10 months, which has been recorded as of age 12 years and 6 months in both calcification and eruption.

CLINICAL APPLICATION OF EXISTING INFORMATION

In reviewing the literature concerning the problems of development and calcification of the deciduous and permanent dentition, one finds many generalized statements and answers to the question "When should a deciduous tooth be filled and when should it be extracted?" There is no doubt that the question of filling or extraction of a deciduous tooth is one of the major problems in dentistry for children, orthodontics and oral surgery. In fact, every branch of dentistry is confronted with the problem of the growing child in one aspect or another. With reference to the young permanent tooth, the crown and bridge specialist wonders when a suitable restoration can be made for a bridge attachment. Most practitioners have empirically decided that a bridge should not be placed before complete calcification of the root end, and many operators wait still longer for pulp recession and secondary dentin development. No one has offered specific evidence that such a restoration cannot be made before the roots are completely calcified. Higley,[19] an orthodontist, says, "Roots continue to form even under orthodontic tooth movement and there is little evidence to prove they would not do so under artificial restorations."

The question whether a deciduous tooth should be filled or extracted has, in the main, been answered in the same empiric manner. No one has made any specific commitment or has presented any given rule to follow. The early loss or late retention of the deciduous teeth is the underlying cause of many cases of malocclusion, and this fact has been recognized in books of orthodontics and pedodontics as well as in articles on these subjects.[16, 20, 21, 22, 23, 24, 25, 26]

McCoy,[24] in his "Applied Orthodontics," says,

> When deciduous teeth fail to show signs of being shed at the time when this process is reasonably to be expected they should be

subjected to roentgenographic examination. Should it then appear they continue a hindrance to the orderly eruption of their successors, such deciduous teeth should be removed. Where such extractions are deemed necessary the roentgenogram will settle any doubt as to whether the deciduous tooth or teeth may be removed without disturbing the developing teeth adjacent to its roots.

He did not indicate what was meant by "being shed at the time when this process is reasonable," and it may be assumed that he meant the average time as presented in the chart of Schour and Massler or that expressed in other charts or tables on the subject. No explanation of the meaning of "hindrance to the orderly eruption of their successors" is given. Although this phase is probably easily understood by students of orthodontics, the problem has not been answered for thousands of general practitioners. Possibly the author referred to sequence of eruption of the permanent teeth. It may also be asked, "When is a permanent tooth ready to assume its place in the arch through eruption? Should a first deciduous molar be removed at the approximate age of 10 years in all patients because such is the average time for shedding or what should determine the course of action?"

In his textbook, Anderson[16] says,

> If through failure to absorb, the deciduous teeth remain in place beyond what is considered to be the normal period (the deciduous central incisor should be lost at about seven years) and shows no looseness, it should be considered a suspicious sign, and an effort should be made to find out what is happening. If the failure to absorb is uniform throughout the deciduous teeth, then little attention need be paid to it; but if only one or two teeth are affected, then the rate of eruption of the permanent teeth to succeed the deciduous one should be noted and the deciduous tooth should be removed at what is considered the proper time for the particular case.

The statement, "if failure to absorb is uniform throughout the deciduous teeth, then little attention need be paid to it," may or may not be good advice. No doubt, the author would recommend routine subsequent roentgenographic examination, and finally would base his treatment on a combination of conditions. The amount of root resorption at each subsequent interval would be one factor, and another factor would be the amount of calcification of the permanent tooth under the deciduous tooth. Anderson says also, ". . . if only one or two teeth are affected, then the rate of eruption of the permanent teeth to succeed the deciduous one should be noted and the deciduous tooth should be removed at what is considered the proper time for the particular case." The question as to the proper time for the extraction of any deciduous tooth and the standards for determining such time has not been answered.

Strang,[26] in his textbook, says that

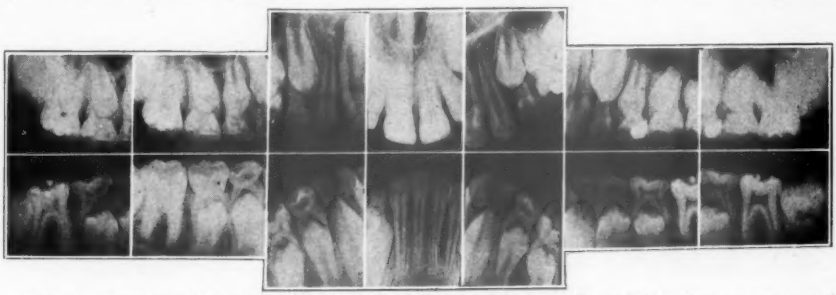

Fig. 4.—Case in which chronologic age is 11 years and 3 months, calcification age 10 to 10½ years and eruption age 8 years.

when the average time for its shedding has arrived, the tooth should be extracted.

Blackwell,[27] who is a teacher of operative dentistry, writes that the deciduous teeth should not be lost before their full term. He also says that occasionally deciduous teeth will be retained too long because the roots fail to resorb. The important issue was not discussed.

In his book "Prevention of Malocclusion," Spencer[25] brings out the fact that age offers no definite index in standardizing a time for the loss or the removal of deciduous teeth. He has presented concrete evidence, with roentgenographic illustrations, as to when a deciduous tooth should be removed in patients with late retention. We do not agree with all of Spencer's conclusions with reference to the extraction of deciduous teeth, but he should be commended for his discussion of the subject.

In his revised textbook "Juvenile Dentistry," McBride[23] says,

> Where teeth are retarded beyond the normal exfoliation period, one can very reasonably assume that either the patient has not developed normally with his years, or there is some abnormal condition present. In either instance a radiographic examination is indicated. It is particularly evident that there is a wide range between the physical and chronological age of the child. . . . Some children, slow in development, may normally retain deciduous central incisors until eight or eight and a half years, molars until twelve to thirteen years, and cuspids until thirteen to fourteen years. Others may lose the same teeth prematurely.

In summarizing the references presented, one may conclude that:

1. The shedding and eruption schedules of teeth vary considerably, and chronologic age is not a criterion in determining whether to extract or to fill a particular deciduous tooth.

2. A roentgenographic survey is essential in many cases in making a diagnosis and in planning treatment.

3. The question "What is the proper time to shed or extract a deciduous tooth?" has not been answered except in part and by one author (Spencer).

4. The problem of relative calcification and eruption of the permanent teeth has not been presented as a criterion as to when or when not to extract a deciduous tooth, or what the proper shedding time is.

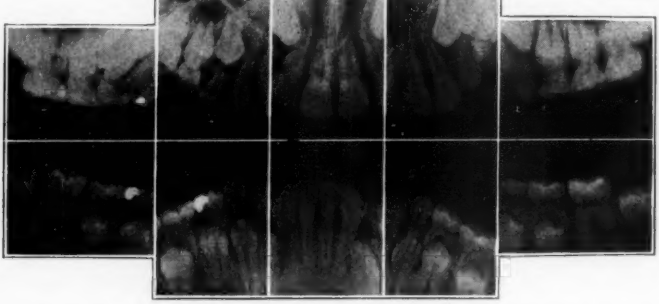

Fig. 5.—Case, in girl aged 10 years and 2 months, in which calcification age is average and eruption age 8 years.

STUDY CONDUCTED WITH REFERENCE TO CALCIFICATION AND ERUPTION OF THE DECIDUOUS AND THE PERMANENT TEETH

This study to determine the variables in calcification and eruption as associated

with clinical problems in dentistry for children was made possible through the facilities of the department of pediatrics at the State University of Iowa Children's Hospital and the pedodontic and orthodontic clinics at the College of Dentistry. The latter are under the direction of L. B. Higley, D.D.S., professor of orthodontics and head of the department.

Three classes of cases were selected at the Children's Hospital: diabetic, general and congenitally syphilitic. Another group, from the departments of pedodontics and orthodontics, was made up of regular clinical cases in the dental school and the patients may be considered well. The total number, including

Fig. 6.—Mouth of hypothyroid patient whose chronologic age is 16. The deciduous cuspid, as well as the first and second deciduous molars, is still present in the upper arch, while, in the lower arch, the deciduous cuspids and second deciduous molars remain.

the four classifications, was 415. The age variation was from 1 year to 14 years and 3 months.

The diabetic group had diabetes mellitus. A large percentage of the children arrive at the hospital soon after the initial warning of the disease, although some enter with considerable evidence of destruction from insulin deficiency. All of these children are placed under observation and given laboratory tests by the medical staff to determine the nutritional and insulin regimen best suited to the case. The child is permitted to go home with definite instructions as to the dietary intake and insulin requirements. These patients return for analysis and study approximately every three to four months. In this particular study, no attempt was made to determine the length of time that the patient had been under treatment.

The general cases were taken at random from the orthopedic, metabolic and pediatric sections of the hospital. Some of the orthopedic patients had been hospitalized for a considerable length of time, while those from the other two sections had been in the hospital a much shorter period. Known cases of rickets, hypothyroidism or hyperthyroidism and pituitary cases were omitted from the survey.

The congenitally syphilitic group varied in the length of time that the individuals had been under treatment, as well as when they had been seen first for therapy. Many of these patients, on entry, are poorly nourished and with obvious physical handicaps. They are placed under observation until the course and method of treatment have been determined and are recalled to the hospital routinely every ten to twelve weeks for analysis and study.

The patients from the dental school are presumably well. They have a wide social and financial range. A large percentage are from families associated with the university, while from 20 to 25 per cent of the entire group are indigent or borderline indigent patients.

METHOD OF MAKING SURVEY

Complete oral roentgenograms for each patient were compared with the recently developed chart of Schour and Massler[17] entitled "Development of the Human Dentition." Findings were recorded with reference to eruption and

calcification. (The authors have determined eruption age in terms of the chart by comparing the amount of resorption of the roots of the deciduous teeth [in case of mixed dentition] as well as the amount of eruption of the deciduous or permanent teeth.) These items were recorded separately and in terms of average, retarded or advanced. For example, if a child was 5 years of age chronologically and in his roentgenograms corresponded to the chart's calcification and eruption age as of 5 years, they were marked average. It was also deemed acceptable because of biologic standards and normal variations to record an average if the range was within six months of the chronologic age level. Therefore, if the eruption or the calcification or both was slightly retarded or slightly advanced within the approximately six months range of the chart, it was marked average. This allowance was also deemed sufficient for the various racial differences. Then, too, a general average was taken of the whole mouth to arrive at a determination. In many instances, the anterior segment or incisors did not correspond to the posterior section in the bicuspid and molar areas. In the majority of readings, the lower teeth were in advance of the upper. The exact opposite was also true in an appreciable number of children. The right side of the arch was not always comparable with the left side, and any combination of opposites could be recorded from some of the examinations. Therefore, an average reading was determined and placed in one of the three classifications.

It is realized that, in general, the eruption of girls' teeth is earlier than that of boys'. However, in this study, this fact was not considered, since the interval is conceded to be within six months.

After the conditions under which this study was made are cited, it is interesting to note, in the accompanying table, that there is no appreciable difference among the three classes of hospital patients or between any one of the hospital groups and the group from the dental school. Sixty-six per cent of the patients came within the range of average in a separate consideration of calcification and eruption. A comparison of eruption with calcification revealed that 28 per cent were retarded in eruption and 10.8 per cent in calcification. Only 6.5 per cent were advanced in eruption, as compared with 22.5 per cent in calcification. It appears that calcification and eruption are two

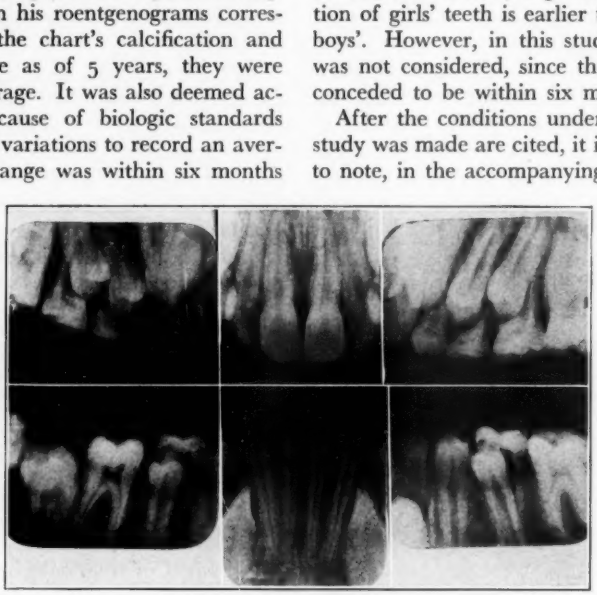

Fig. 7.—Teeth of patient referred to in Figure 6. The calcification age is 12 to 13 years; the eruption age, approximately 9½ to 10 years.

distinct processes that do not necessarily correspond to those of the chronologic age, and their readings may be different in the same mouth.

Another finding of interest and considerable clinical significance is that in only 45 to 49 per cent of patients did the chronologic, calcification and eruption ages correspond with those on the chart in every way. Figure 1 is an example of a relatively equal age grouping. In other instances, eruption may be retarded and the calcification may be average in the same patient, or vice versa; or any combination with respect to retardation or advancement may be found. (Fig. 2.) It is estimated, in determining calcification of the teeth in terms of clinical eruption without the use of the roentgenogram, that the probable error in diagnosis is at least 50 per cent. A dental examination without roentgenograms consequently is at best only guesswork as it pertains to many of the really vital problems in the present and future dental life of the growing child.

Fig. 8.—Case referred to in Figures 6 and 7; appearance of mouth September 17, 1940. The patient received 1 grain of thyroid extract four times a day from that date. The open bite can be noted.

Another illustration is that of a boy 9 years and 10 months of age. (Fig. 3.) The eruption age and calcification age are approximately the same, 12 years and 6 months. The question might be presented, "When can this boy have a fixed bridge?" He is less than 10 years of age, yet his second bicuspid and molar roots are nearly closed. The pulps in his posterior teeth are no larger than those of the average late teen-age. In all probability, orthodontic treatment will have to be resorted to, moving the second molars forward to contact the second bicuspids or create sufficient space to place a space maintainer or a bridge. What criterion do crown and bridge specialists follow with reference to calcification of the permanent dentition and bridge placement? This is indeed a problem which needs a logical approach since there is no doubt that some persons of teen-age are ready for any type of fixed bridge. The pulps in the central and lateral incisors in this boy are comparatively large and a standardized three-quarter preparation for a bridge abutment, if needed at this time, would be a questionable procedure. Also, if any tooth replacement is contemplated in the anterior permanent segment, one must consider the growth and development as well as the eruption schedule. A fixed attachment, as for an anterior temporary or fixed bridge, in most instances should not be placed on the permanent and lateral incisors, before the complete eruption of the permanent cuspid and adjacent bicuspids. Such a fixed attachment on the permanent lateral incisor will not permit the normal adjustment of position intended in the arch particularly where there is a distal inclination of the crown. This distal inclination is a perfectly normal pattern, and subsequent vertical as well as labial and lingual adjustment is made during the eruption of the cuspid.[19, 28]

Figure 4 is the roentgenographic survey of a boy 11 years and 3 months of age chronologically. The eruption age was found to be about 8 years upon

checking the number of permanent teeth erupted and amount of resorption of the roots of the deciduous teeth. The calcification age is about 10 to 10½ years. The root ends of the first permanent molars and upper permanent lateral incisors are not completely developed. This patient was recorded as retarded in eruption and calcification in relation to his chronologic age with reference to Schour and Massler's chart of averages. The first bicuspids in the average arch erupt at the age of 10, and yet, in this instance, very little, if any, resorption has taken place at the roots of the deciduous first and second molars. The eruption of the lower cuspid is more advanced than that of the adjacent bicuspids, and, in all probability, this will result in an undesirable eruption relation, since it is agreed generally that the first bicuspid should precede the cuspid.[17, 24, 25]

Fig. 9.—Case referred to in Figures 6-8. The epiphyseal and carpal development of the hand is that of 7 years and 3 months.

It may be said that if the roots of the permanent teeth are one-half calcified, the teeth are developed sufficiently to assume their places in the mouth. Such

teeth can attain sufficient stability to withstand the initial forces of mastication. It may be added that the root calcification is sufficient in this case to permit eruption. (Fig. 4.)

Should the deciduous molars be extracted at this time? To find the answer to this question, the practitioner no doubt would observe the general development of the child and inquire concerning eruption schedules of the rest of the family and the time of eruption of the patient's first deciduous tooth. If the child had a history of considerable illness or was markedly underdeveloped, a physical examination would be desirable.

Fig. 10.—Case shown in Figures 6-9; January 11, 1941, four months after thyroid treatment was begun. The bite is almost closed. The crowns of the permanent teeth have erupted farther, and there seems to have been some development in the anterior maxillary segment.

One need not be too concerned with a one or two year retardation, but systemic deficiencies may be expected or should at least be ruled out if retardation in calcification or eruption or both exceeds this period. Other conditions which also would tend to determine procedures are the present status of function, existing malocclusion and the economic resources of the family.

In this particular case, the functional and developmental patterns were essentially average, and the parents could well afford reasonable dental service. Under these circumstances, it would be acceptable to extract all of the first deciduous molars, giving the first bicuspids an opportunity to precede the permanent cuspids. It would be necessary to observe the spaces so that no appreciable closure would be permitted. If there had been no apparent difference in resorption between the deciduous cuspid and first deciduous molar, it would have been acceptable to observe the case for another six months or even a year to see what progress, if any, had been made as evidenced by subsequent roentgenograms. If all quadrants of the dental arches show about equal resorption and there is no existing local problem, a six months' or year's additional observation period is advised.

Early extraction of the deciduous teeth alters the problems materially. If calcification levels of the permanent tooth or teeth are acceptable for eruption and an upper or lower deciduous tooth is extracted, frequently the corresponding tooth in the lower or upper arch on the same side of the mouth is removed. This is done more often in the second deciduous molar area to permit normal anterior shifting of the first permanent molar. The upper and lower arches must, as far as possible, maintain their synchronization of growth and development. To attain and maintain the correct interdigitation is an all important factor in consideration of an extraction.

Another roentgenographic survey is presented in Figure 5, that of a girl aged 10 years and 2 months chronologically. The calcification age is average, but in eruption the age is only 8 years. All quadrants of the arches are about the same, and the resorption schedule is acceptable with reference to cuspid and

bicuspid areas. Such deciduous teeth can be filled if necessary and retained for at least a year to study the progress in resorption. If there has been no progress in resorption by the end of the year, extraction of all of the first deciduous molars is advised. The eruption schedule of the first bicuspids would then be observed. If the first bicuspids erupted within a six months' interval, the extraction of the second deciduous molars and deciduous cuspids is advised, if there is no evidence of resorption of these teeth. The second deciduous molars and cuspids could be retained for another year if some resorption was taking place. If eruption did not occur in the first bicuspid within the six months' interval, a physical examination would be advisable to determine the relative metabolic activity. In this event, the deciduous cuspids and second deciduous molars could be retained for another year to determine the progress. In the upper central and lateral incisor and cuspid segment also can be seen a relatively normal unfolding process in which the lateral incisors have a distal inclination and the cuspids are assuming a favorable position. In the event of loss of one of the upper central incisors, it would be unwise to stabilize the lateral incisor with a fixed bridge, since there is an intended shift as the cuspids erupt. Therefore, orthodontic bands or castings are not acceptable as fixed attachments for the replacement of a lost permanent central incisor before the cuspid has assumed its intended position in the mouth.

DATA ON CASES STUDIED

Class of Case	Number*	Eruption Age			Calcification Age			Remarks
		Average	Retarded	Advanced	Average	Retarded	Advanced	
Diabetic (Hospital group)‡	100	66 or 66%	25 or 25%	9 or 9%	64 or 64%	13 or 13%	23 or 23%	48% show similar (average for chart) eruption and calcification schedule.
General (Hospital group)*	150	92 or 61%	42 or 28%	16 or 11%	103 or 68%	13 or 9%	34 or 23%	49% show similar (average for chart) eruption and calcification schedule.
Congenitally syphilitic (Hospital group)*	33	23 or 70%	9 or 27%	1 or 3%	24 or 73%	0 or 0%	9 or 27%	48.5% show similar (average for chart) eruption and calcification schedule
Well (Dental school)†	132	89 or 67.5%	41 or 30.5%	2 or 1.5%	86 or 65%	19 or 14.5%	27 or 20.5%	45.5% show similar (average for chart) eruption and calcification schedule
Total	315	270 or 65.5%	117 or 28%	28 or 6.5%	277 or 66.7%	45 or 10.8%	93 or 22.5%	

*Patients at the State University of Iowa Children's Hospital.
†Well patients in the pedodontic and orthodontic clinics at the College of Dentistry.
‡Age range from 1 year to 14 years and 3 months.

A series of pictures (Figs. 6-10) of a hypothyroid patient are presented for comparison with those showing no apparent specific deficiencies. The condition is extreme, and we agree with Schour[29]:

That the endocrines may play a rôle in malocclusion need not be questioned, but such incidence is low. The employment of endocrine therapy in dentistry is scientifically unsound. It is reasonable to suppose that if

a given malocclusion is a result of an endocrine disturbance, the treatment indicated is one that will attack the original endocrine disorder.

This patient was not included in the study, but the case is introduced to show the influence that the endocrines can have upon metabolic processes as associated with the teeth. Possibly in the future those practitioners interested in orthodontics and dentistry for children will find it advantageous to call for a metabolic analysis in late retention problems.

The patient, a girl, was born March 8, 1924, weighing 8 pounds. She was originally admitted to the hospital December 20, 1933, at the age of 9 years. The height was 47 inches and the weight 50 pounds. The I. Q. was 92. The general complaints were anemia, malnutrition and puffiness of the face. The blood Wassermann and Kahn reactions were negative. The case was diagnosed at the time as a possible chronic infection of the nasal sinuses and possible hypothyroidism, which was later ruled out. The patient was discharged December 22.

The patient was readmitted to the hospital September 17, 1940, at the age of 16. The weight was recorded as 64 pounds and the height 48 inches. Her physician had given her a course of thyroid treatments for from three to four months. The abdomen was protuberant and the face puffy. Icthyosis was noted. The hair of the scalp was coarse and there was no pubic hair. There were four small permanent incisors as well as six deciduous teeth in the upper arch. (Fig. 6.) The calcification age was between 12 and 13 years. The eruption age was approximately 9½ to 10 years. (Fig. 7.) Figure 8 shows a very definite open bite. The basal metabolic rate was minus 34 per cent, and the cholesterol value was 341 mg. per hundred cubic centimeters. The I. Q. was now recorded as 61. The bone age according to Todd's "Atlas of Skeletal Maturation of the Hand"[4] was listed as 7 years and 3 months. (Fig. 9.) Thyroid extract was prescribed, 1 grain four times per day beginning September 17.

The patient returned to the hospital January 11, 1941, having been at home undergoing thyroid extract therapy for about four months. The bone age was now listed as 9 years and 9 months, and the basal metabolism rate plus 10 per cent. Figure 10 illustrates the closure of the open bite (Fig. 8), which no doubt took place through the further eruption of the central incisors and some development in the anterior maxillary segment. The patient was advised to continue the thyroid extract in the same dosage, and to return three months later.

She returned April 16, with a height of 51.5 inches and weight of 65 pounds. The height increase during the seven months interval had been 3.5 inches and the weight increase 1 pound. The basal metabolism rate was recorded as plus 18 per cent and the cholesterol reading as 181 mg. The bone age was approximately 10 years. The lower bicuspids were in place. The patient will return for further study and observation in a short time.

This case must be listed as outside the realm of the normal or average. The question can well be asked as to what range of variation may be considered normal. There seems to be no definite answer to this all important question. Each individual is endowed with a heredity pattern and with it certain limitations and potentials for growth and development. Certainly not all those classed as retarded or advanced can be referred to as abnormal. It must be conceded that there is no definition at this time which applies to all patients with reference to calcification and eruption. Krogman[9] says, in referring to general growth and development:

> Variation is the rule, and its bounds may be assessed. Therefore, we accept as normal an average and plus or minus its standard deviation, between which 67 per cent of the population will fall.

This study does not permit us to come to any specific conclusion as to what is considered within the range of normal. It may be said, however, that, in using Schour and Massler's chart as an index, 66 per cent of the findings with relation to calcification and eruption fell within the range of average, when these factors were considered separately. Each case must be analyzed, then, on an individual

basis. This can best be accomplished by knowing the averages as expressed in the chart and then making a diagnosis with the aid of roentgenograms. The analysis presented in Figures 3, 4 and 5 is the approach suggested when variables are evident. There no doubt will be differences in interpretation and treatment, depending on the dentist's experience and interest in the growing child patient.

Although a definition of normal variables in calcification and eruption cannot be given at this time, the dentist should be aware of the fact that obvious abnormal variables due to certain diseases may occur. He should be able to detect the gross variables which may be abnormal in calcification and eruption and direct such cases to the proper medical channels for consultation.

SUMMARY

This study was conducted primarily to determine the variables in the eruption and calcification schedule of the deciduous and the permanent dentitions as associated with clinical problems. The charts and tables that have been developed with reference to these two processes are based on averages, and it was our desire to compare a series of roentgenograms with the more recently developed chart of Schour and Massler entitled "Development of the Human Dentition." Four hundred and fifteen patients were selected, all but 132 from the Children's Hospital at the State University of Iowa. The remainder of the group came from the departments of pedodontics and orthodontics in the college of dentistry.

It was found that there was no appreciable difference between the calcification and the eruption periods of the various groups in the hospital and the group of patients from the dental school. In a comparison of the roentgenograms of the patients with Schour and Massler's chart, 66 per cent of the patients fell within the range of average in a separate consideration of calcification and eruption. Twenty-eight per cent of the patients were retarded in eruption, and 6.5 per cent were advanced in this process. In a comparison of eruption with calcification, 28 per cent were found retarded in eruption and 10.8 per cent retarded in calcification. Only 6.5 per cent were advanced in eruption as compared with 22.5 per cent who were advanced in calcification.

It is important clinically that in only from 45 to 49 per cent of the patients do the chronologic, calcification and eruption ages correspond exactly with those in the chart.

CONCLUSIONS

1. Calcification and eruption of teeth are two distinct processes.

2. Calcification age and eruption age do not necessarily correspond with chronologic age. In this study, the following differences were observed in comparison with Schour and Massler's chart:

(a) Approximately 66 per cent of the children had average schedules of calcification and eruption, when considered separately.

(b) Twenty-eight per cent of the patients were retarded in the eruption of teeth, while only 6.5 per cent of the children were advanced in this process.

(c) Ten and eight-tenths per cent of the patients were retarded in calcification, and 22.5 per cent were advanced.

(d) In approximately 50 per cent of these patients, the chronologic, eruption, and calcification ages corresponded exactly to those in the chart. In the remaining 50 per cent, eruption could be retarded and the calcification could be average in the same patient or vice versa, or any combination with respect to retardation and advancement could be found.

(e) In determining calcification of the teeth in terms of eruption without the use of the roentgenogram, the probable error in diagnosis is estimated as at least 50 per cent.

3. There was no apparent difference in calcification and eruption in diabetic, general hospital and congenitally syphilitic cases and normal cases.

4. When eruption was used as a criterion in determining the physiologic age or maturation of a child, roentgenograms were essential to determine the relative stage of eruption and calcification as well as the presence or absence of teeth.

5. In addition to chronologic age, the factors of eruption and calcification age should be included in the examination chart for children and such interpretations should be made by the use of roentgenograms.

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CORRELATION BETWEEN FACE FORM AND TOOTH FORM IN YOUNG ADULTS

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THE widely accepted hypothesis of the Trubyte system, which teaches that "when selecting teeth for full dentures, the dentist should select a form which harmonizes with the form of the patient's face,"[1] has been advanced since 1914 as the proper method for determining the form of artificial teeth for edentulous patients. This hypothesis, the outgrowth of a study by J. Leon Williams, has resulted in the widest development of tooth forms, sizes and classification in the history of dentistry. It is the basis of the Trubyte system of tooth selection, the teeth consisting of square, tapering and ovoid teeth of typal and modified forms and graduated sizes, which displaced the former temperamental system with its chaotic array of teeth and its vague hypothesis.

The prompt acceptance of Trubyte teeth by the profession caused other tooth manufacturers to change over to new systems, which imitated the square, tapering and ovoid tooth forms contained in this system.

This development in artificial teeth has been beneficial to the dental profession, tending to simplify, though not to solve, the dentist's esthetic problems by placing at his disposal a system which presumably removes the guesswork from tooth selection by using the facial outline as the basis of tooth form. It has elevated the practice of prosthesis by introducing new forms and graduated sizes of teeth, with which the profession has been able to render a more artistic, more effective and a more appreciated type of service to the public. It has tended also to increase respect for those biomechanical practices in the field of prosthetic dentistry which, in the past, were dreaded by the public because of the unnatural appearance generally resulting from prosthetic restorations. For these and other benefits which have accrued to the dental profession and to the public, the manufacturers are to be commended and encouraged to further developments.

While no serious objection has been raised to the present forms and sizes of artificial teeth, there has been increasing criticism of a method of selecting teeth which is based on the assumption that tooth form and face form should be similar. Doubt as to the validity of the tooth-form, face-form hypothesis has been expressed by many essayists and clinicians who have discovered through experience that the form of the tooth and that of the face are frequently unlike, and also that this dissimilarity between tooth and face form does not make such combinations inharmonious.

In view of this outspoken criticism of the hypothesis, I shall present a progress report of a study begun six years ago. The purpose of this study was to provide each student in the School of Dentistry at the University of Pittsburgh with a record of the form of his face and the mold and color of his upper central incisors. At times, this study included many other items, but, for the present purpose, only the data relating to face form and tooth form will be presented.

The type and the form of the face

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were determined both by visual observation and by the use of the Wavrin True-type Tooth Guide, as is recommended by the manufacturer. The class and the form of the teeth were determined by selecting from the mold guide a tooth which, in form and size, matched the natural maxillary central incisors as nearly as possible.

The study included a total of 632 young adults, of whom 600 presented data on both face and tooth form. These data will be analyzed in two groups, the first group containing those individuals having similar tooth and facial outlines, and the second group, those having dissimilar tooth and facial outlines.

First Group.—This group contains 236 individuals, or 39.3 per cent of the total. Of these, only seventy-eight, or 13 per cent of the total, had identical tooth and facial outlines. The remainder, 158, or 26 per cent of the total, had tooth and facial outlines which were of the same general class and type, but were not identical in form.

TABLE 1.—CLASSIFICATION AND DISTRIBUTION OF FACE FORMS.

Form	Square	Tapering	Ovoid
1	2	39	0
2	1	10	0
3	2	101	63
4	18	172	1
5	1	220	..
6	0	2	..
Total	24	544	64

Second Group.—A majority of persons examined had tooth and facial outlines that were dissimilar. Of the total, 364, or 60.7 per cent, were found in this group.

A further analysis was made in order to discover, first, the distribution of face form, and, second, the distribution of tooth forms in young adults. This information follows.

Distribution of Face Form in Young Adults.—Of 632 young adults, twenty-four had square, 544 tapering and sixty-four ovoid faces. The majority, 477, or 75.5 per cent, had nontypal, or modified, face forms; the remainder, 155, or 24.5 per cent, typal face forms. The 477 nontypal faces were distributed as follows: nineteen modified square, 394 modified tapering and sixty-four modified ovoid. The 155 typal face forms were distributed as follows: five typal square, 150 typal tapering and no typal ovoid.

From the data in Table 1, we see that the tapering face, including typal and nontypal, is predominant, constituting 86 per cent of the total.

Distribution of Tooth Forms in Young Adults.—Data on the distribution of tooth forms in a group of 610 young adults are given in Table 2. Of 610 persons, 347 had square, 234 tapering and twenty-nine ovoid tooth forms. Among these are 401 typal forms and 209 modified or nontypal forms.

TABLE 2.—CLASSIFICATION AND DISTRIBUTION OF TOOTH FORMS.

Form	Square	Tapering	Ovoid
1	112	32	6
2	122	25	7
3	50	47	14
4	35	39	2
5	28	39	..
6	..	52	..
Total	347	234	29

Table 2 shows that typal teeth were predominant, constituting 65.7 per cent of the total; also that about three-fourths of these were square. All of the square teeth, including tapering square and ovoid square, grouped together represent a majority, 63.6 per cent, of the total.

These data indicate that the predominant face form in young adults is nontypal and tapering, while the predominant tooth form is typal and square.

DISCUSSION

These data confirm the statement of the manufacturer that "a few individuals exhibit practical identity of form and proportions in faces and teeth."[2] As previously shown, only seventy-eight per-

sons, or 13 per cent, had identical face form and tooth form. This observation partially confirms the manufacturer's statement that "in a great number of persons, the form and proportions in face and teeth are approximately alike."[3] However, a question is raised as to the meaning of the phrase "in a great number of persons." If it is intended to convey the idea that a majority are alike, the statement is erroneous, for previous data show that 39.3 per cent were similar, and of these only 13 per cent were identical. Presumably, it was intended to indicate that a greater number have approximate similarity in face and tooth form, as compared with those few who have identical face and tooth form.

A majority, 60.7 per cent, of the persons examined had teeth which in form were unlike the facial outline. This finding does not agree with the manufacturer's statements that "Nature harmonizes tooth form with facial outline"[4] and that "in a relatively small number the proportions or forms in face and teeth are noticeably unlike and produce a displeasing disharmony."[5] Instead of finding few persons whose face form and tooth form were noticeably unlike, a majority were found in this group. The study does not confirm the statement that this dissimilarity "produces a displeasing disharmony." In fact, all except a few persons with tooth defects had a pleasing and natural appearance which did not disclose an incongruous correlation of tooth and face form. It may be assumed, therefore, that dissimilarity in tooth form and face form does not constitute disharmony. Actually, the teeth comprise so small an area in comparison with the size of the face that few persons, not excepting dentists, are aware of the shape of their own teeth or face. It is even difficult for many dentists to determine the difference between tooth form and face form, unless the forms are typal. Therefore, we can assume that dissimilarity in tooth and face form is neither obvious nor inharmonious.

This study of the distribution of tooth form and face form in young adults does not justify the manufacturer's statement, "In cases where all the anterior teeth are to be replaced, it enables him (the dentist) to select teeth to harmonize with the face, whether the natural teeth did or not."[6] Such practice by the dentist would result in artificial teeth unlike the patient's own teeth, probably two times out of three, according to these data. Dentists having experience in immediate denture prosthesis will affirm that the patient wants artificial teeth which, except for defects, blemishes and malposition, resemble his own teeth. If dissimilarity between tooth form and face form constituted obvious disharmony, a majority of these patients would insist on having teeth which differ from their own.

The following axioms published by the manufacturer are open to discussion:

> Beauty in dentures depends more upon harmony between face form and tooth form than upon the form of the teeth considered alone. . . . Partial anterior restorations are most pleasing when artificial teeth are like the remaining natural anterior teeth in form, proportion and character.[7]

The question arises, If artificial teeth which match the patient's own teeth are most pleasing in partial dentures, why are they not most pleasing in complete dentures also? Since the dentist faces the probability of being wrong, according to Nature, two times out of three, if he selects teeth to match the face form, he would do well, whenever possible, to use artificial teeth similar to the patient's own teeth. He should select teeth to match the sound natural teeth not only in form, but also in size, which, although the teeth are sometimes apparently too large or too small, constitutes one of the most characteristic features of human teeth. In 1 per cent of patients examined, the right and left central incisors were entirely different in form. For example, one patient had a square left central and a tapering right central, a disparity which did not at all mar the appearance.

The manufacturer further states: "Natural teeth of a pleasing appearance in the mouth invariably harmonize in form and proportions with the face form; that is, square teeth are the most beautiful and harmonious in a square face; tapering teeth in a tapering face; ovoid teeth in an ovoid face."[8] Such a position does not appear tenable in the light of this study, which discloses that pleasing appearances were the rule in spite of the fact that 60 per cent of persons had tooth and face forms that were unlike.

We may infer from this that Nature obtains pleasing effects in facial appearance by contrast more frequently than by conformity. A study of art will reveal that contrast is one of the most important rules for obtaining harmony in architecture and painting. The principle of contrast may be illustrated by comparing the utilitarian art displayed in a row of rectangular apartment buildings, having square doors and windows, with the facade of a cathedral such as the world-renowned Chartres, whose two rectangular towers rise to the roof, where one is crowned with a square cap and a long tapering spire, while the other has an octagonal cap and a tapering and higher spire. Between the two towers is one of the largest and most beautiful circular rose windows in the world. The geometric forms: the square, the triangle and the circle, are as old as the history of man, and their universal use in combination suggests that contrast is an attribute of art.

Another popular use of contrast is to be found in the selection of women's hats. Well-trained sales people, who are interested in the best possible appearance of their clientele, study the face and make an effort, through contrast, to minimize undesirable features of the round or fat face, the face with sharp lines, etc., by selling the customer a hat which furnishes the complementary form and size needed to improve the appearance. Teeth likewise can be used to modify the facial expression by avoiding the use of teeth that would accentuate dominant esthetic features. For example, the use of typal tapering teeth in the mouth of a woman who has a bony, typal tapering face is not recommended.

One fact not to be overlooked in selecting teeth to match the facial outline is that the facial outline is subject to change. Obesity or loss of weight may cause a marked change in the facial outline, which, according to the hypothesis, would require a change of tooth form to correspond with the change in face form.

The following statement by the manufacturer describes more accurately the actual distribution of tooth and face forms in nature than the conformity hypothesis, which has been shown to be erroneous.

> There is no necessary harmony in either size or form between the face as a whole or any of the features and the teeth. People with small faces often have large teeth. People with large faces occasionally have small teeth. People with square heads and faces have tapering or ovoid teeth. Disharmony is as common as harmony.[9]

The frequent occurrence of dissimilarity in nature does not of necessity signify disharmony. Therefore, the last sentence should read: Dissimiliarity between face form and tooth form is more common than uniformity.

This observation brings up the question of inherited characteristics. Are tooth form and face form inherited? In general, geneticists assume that the presence of multiple independent sets of genes affects the size and form of the teeth, jaws, face, skull and many other features. This genetic relationship has been studied in racial crosses wherein individuals of different races have been brought together; in particular, when a race with large jaws and correspondingly large teeth and a race with small jaws and correspondingly small teeth intermarried. Some of these genetic crosses resulted in large jaws with small teeth, and—what was more disastrous—small jaws with

large teeth, some of which cracked the jaw bone to provide space for their eruption.

Presumably, in stable, long isolated races, there may be a tendency to correlate the size and form of the teeth and the size and form of the jaw and other features which make up the racial characteristics. However, in a heterogeneous population such as ours, with an inheritance of numerous racial characteristics, it appears logical that similarity of tooth form and size and jaw form and size would occur rather infrequently and that similarity between tooth form and face form would occur still less frequently because of the multiple independent sets of genes which presumably control these characteristics.

With all the natural variations in teeth, and faces which lend individuality to the person, it is conceivable that the advocated standardization of tooth selection according to the tooth-form, face-form hypothesis could do much to curb the dentist's initiative in the artistic phases of prosthetic dentistry and ultimately lead to monotonous uniformity, if 85 per cent of denture wearers should have tapering faces and tapering teeth.

No attempt is made to depreciate the valuable contribution which manufacturers have made to the forms and sizes of available teeth. However, objection is made to the standardized method advocated for their use, which, as has been shown, is contrary to the distribution of tooth and face forms in nature.

SUMMARY

1. The development of artificial teeth of typal and modified forms and graduated sizes has been valuable to the dental profession and the public.

2. Objections have been raised by the profession to the practice of selecting teeth to match the form of the face in complete denture prosthesis without regard for the form of the natural teeth.

3. Face and tooth forms were similar in 39.3 per cent and identical in only 13 per cent of those examined in this study. The majority, 60.7 per cent, were dissimilar.

4. Tapering faces, predominantly non-typal, were found in 86 per cent, while square, predominantly typal teeth made up 65.7 per cent of those examined.

5. Regardless of dissimilarity in tooth and face forms, nearly all faces presented a pleasing and natural appearance, and the lack of similarity between tooth form and face form was neither obvious nor inharmonious.

6. Contrast in form rather than uniformity appears to predominate in nature as it does in the arts.

7. The recommendation that the patient's own teeth should be matched in partial denture restorations, but that artificial teeth for complete dentures should match the facial outline whether they match the patient's own teeth or not is not acceptable in the light of this study.

8. From the standpoint of genetics, it appears highly probable that there would be widespread dissimilarity between tooth form and face form in a heterogeneous population like ours. Correlation, if present, exists between dissimilar face forms and tooth forms.

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FURTHER STUDIES ON THE RÔLE OF VITAMIN D IN THE NUTRITIONAL CONTROL OF DENTAL CARIES IN CHILDREN

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THAT the state of the teeth is not independent of bodily conditions is well known. One systemic factor in dental conditions, namely nutrition, has been under investigation for some time. Whatever theoretical view is held regarding the initial processes leading to dental caries, it would be rather radical, in the light of recent evidence, to hold that systemic results of nutrition are a matter of indifference in efforts at caries control. Apparently, the status of calcium metabolism *per se*, and as it is controlled by vitamin D, is a phase of the subject which lends itself to experimental investigation more readily than some of the other systemic effects.

It may be well to mention the particularly pertinent literature. Among the earliest of the reports are the studies of May Mellanby, who showed that, over a considerable age range, the simple addition of vitamin D to the diet, either in the form of irradiated ergosterol or as a cod liver oil supplement, reduced the incidence of caries.[1] At that time, irradiated ergosterol was still held to be identical with the vitamin D of cod liver oil. (In this paper, the terms irradiated ergosterol, activated ergosterol and viosterol are used to designate a type of vitamin D related to plant sterol in structure, in contrast to the animal type of sterol structure represented by the vitamin D of cod-liver oil.) We now know that the two forms of vitamin D are chemically different substances and can have different physiologic effects.[2] Mellanby's findings indicate that artificially irradiated substances are less effective in caries prevention than the vitamin D occurring naturally in cod-liver oil. Boyd and Drain, in their extensive observations on children of school age, found that a diet well supplied with protective foods, including milk and vitamin D, not only reduced the existing caries, but also prevented the formation of new lesions.[3, 4] Anderson and his coworkers have reported separate observations on young children (3 to 10 years) and older ones (11 to 16 years). A vitamin D supplement which greatly reduced caries in the younger group had a decidedly slighter effect in the older group.[5]

Previous studies from this department have shown that:

1. An effect just as definite as that obtained by the use of dietary supplements can be achieved by producing increased amounts of vitamin D in the body through exposure to a suitable source of ultraviolet light. Since the diet was unchanged, the conclusion is warranted that vitamin D alone has a definite effect.

2. Graded levels of vitamin D intake (given as vitamin D milk) showed a correspondingly graded response in caries prevention.

3. In two successive years, a group of

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children receiving irradiated ergosterol (viosterol in oil) exhibited smaller preventive effects than a group receiving a cod liver oil supplement, even though the dose of artificially activated ergosterol (viosterol) expressed in USP units of vitamin D was considerably larger than that of cod-liver oil.[6]

We now present a report on a part of the 1940-1941 studies which deals particularly with the further extension of two phases of the previous work. First forms of vitamin D also seemed to merit further consideration. Admittedly, in the earlier studies, the groups in which the comparison was made were rather small. Also, it has been stated by others that vitamin D in highly concentrated form is less active than in more dilute form, or more finely dispersed in the medium.[7, 8, 9] In our previous studies, the irradiated ergosterol had been in a more concentrated form than that of the various cod-liver oil preparations.

MEAN AGE AND DIETARY REGIMEN OF EXPERIMENTAL GROUPS; MEAN INCREASE IN CARIOUS SURFACES OF PERMANENT TEETH OF GROUPS*

Supplement Added to Institutional Diet per Child per Day†	Mean Age Group‡	Mean Increase in Carious Surfaces per Child	Standard Error#
No supplement	10.1	4.50	0.37
800 units viosterol	12.5	2.48	0.18
400 units vitamin D of cod liver oil	12.0	2.48	0.25
3200 units viosterol	11.7	2.27	0.33
800 units vitamin D of cod liver oil	12.2	1.65	0.26

*October 1940 to May 1941 inclusive.

†The indicated unitages and types of vitamin D were administered as chocolate vitamin D milk. Each child in the experimental groups received the same amount of syrup daily. The control group did not receive the chocolate syrup.

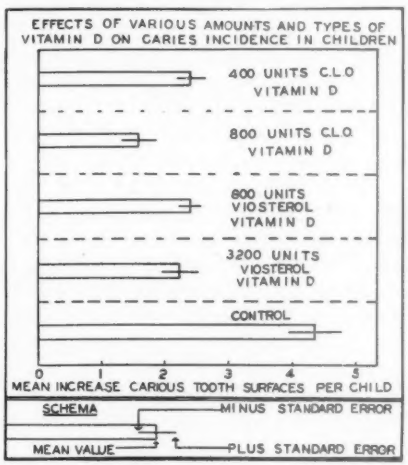
‡This value refers to the last birthday at the first examination.

#These values allow the following conclusions to be drawn: 1. The ingestion of the various unitages of viosterol and the vitamin D occurring naturally in cod liver oil significantly reduced the mean number of new carious tooth surfaces per child in the several experimental groups when compared with the mean value obtained in the control group. 2. There were no significant differences between the results obtained in groups receiving 800 and 3,200 units of viosterol and 400 units of the vitamin D of cod liver oil, respectively. 3. The group receiving 800 units of the vitamin D of cod liver oil had significantly fewer new carious tooth surfaces than the groups receiving 800 units of viosterol and 400 units of the vitamin D of cod liver oil, respectively. 4. The group receiving 800 units of the vitamin D of cod liver oil per day per child had fewer new carious tooth surfaces than the group receiving 3,200 units of viosterol, yet the difference cannot be accepted as significant because the critical ratio between the difference and its standard error is not large enough to justify such a conclusion.

of all, it seemed desirable to obtain more information on the effects of various levels of vitamin D intake. In view of the increasing interest in better nutrition as a public health measure, as illustrated especially by the recent National Nutritional Conference in Washington, questions regarding levels of dietary supplements which are to be recommended take on an increasing importance. The question of the different effects of the two

For the present report, data are chosen from a school in which last winter's studies were carried out. Efforts were directed particularly to the two questions mentioned. This school houses, as their permanent residents, about 250 children, in ten cottages of nearly equal size. It is situated outside New York City in a very desirable environment, favorable to outdoor life and exposure to solar radiation when available. The cottage system

facilitated the division of the children into observational groups. By combining the cottages in twos, five suitably sized groups became available. The institutional diet is planned for the whole school by an experienced full-time dietitian, the materials for the separate cottage kitchens being issued from a central storeroom. The well-planned diet includes an ample supply of milk and other protective foods. A predetermined amount of vitamin D for the several groups was given in the milk regularly consumed at table. During the study, by agreement with the superintendent and school physician, all individual vitamin D therapy was omitted so as not to interfere with the study as planned. Records of the work done by the school dentist were made available, as well as full reports on common colds and other minor ailments.



For daily administration of known amounts of vitamin D, the following procedure was adopted: Preparations of viosterol and vitamin D concentrate from cod-liver oil assayed for the USP unitage of D were obtained from reliable manufacturers. Through the kindness of another manufacturer, these were placed in chocolate syrup, made up in quantities to cover the entire period of study. Two concentrations of viosterol and two of vitamin D from cod-liver oil were employed. Under supervision, each concentrate was weighed out and incorporated in the syrup and again checked by biologic assay. In each case, the amounts were so chosen that a 1:10 dilution of the chocolate syrup with milk resulted in chocolate milk of the desired unitage. One glass of the particular capacity used by the school contained 400 or 800 units of vitamin D from cod-liver oil, or 800 or 3,200 units of viosterol in highly dispersed form. Each cottage was supplied with graduated measuring and mixing vessels and was given clear directions so that chocolate vitamin D milk could be served daily in each cottage in the proper dilution and amount. Periodic assays on the milk as served checked the adequacy of these procedures.

As was to be expected, a certain number of removals from the school and a few cases of illness or absence for other causes reduced the groups somewhat. This reduction was rather uniform throughout the cottages, and the final number in each of the five groups was about forty. No cases of continued irregular consumption were found, the palatability of the chocolate milk probably contributing to the regularity of intake.

(Chocolate milk can be recommended both as a help in furthering regular milk drinking in children and as a means for administering concentrated dietary supplements. The belief occasionally encountered that the regular consumption of chocolate has constipating effects was voiced by some of the personnel in charge of five cottages. They were told to observe carefully and report any such indications. The nurse's records, which regularly include this item, were also examined. In no case was there any evidence of an effect on the bowel movements or any other adverse effects from the regular intake of the particular

chocolate syrup used in this study for approximately 200 days.)

Examinations were made 230 days apart (September 1940 and May 1941). Three days were taken for each examination, with Drs. John A. Esposito, Alvin Weiss, Joseph A. Cuttita and Harold Weinberger assisting. The children were taken in the same order each time. The mean values for the increase in new carious surfaces are given in the accompanying table and illustration. In the control group, this value was 4.50, which lies in the lower range of similar observations in previous studies. In view of the findings of East,[13, 14] the result is easily accounted for by the unusual stretch of clear, sunshiny weather which the vicinity of New York City enjoyed in the early spring of 1941. (Weather Bureau records show that the months of March, April and May 1941 had 20.3 more hours of sunshine than the average over a period of forty-five years; 16.6 per cent more sunshine hours during the same months of 1941 than 1934 when the previous study was made.) The daily administration of 800 units of vitamin D from cod-liver oil reduced this value to 1.65, while administration of 400 units of the same type of D brought the caries incidence to 2.48. The relation of the effects of the two doses of cod-liver oil D is comparable to that previously given by one of us (McB.) for the same two doses.[15] The two levels of viosterol, each having a measurable effect, were no more effective than 400 units of D from natural sources. This result may seem surprising, but it confirms the earlier reports of one of us (McB.) on the slight effectiveness of this preparation. The negligible increase in activity when the unitage is raised from 800 to 3,200 is entirely in line with the results of elaborate and careful observations by Massengale and Bills on its mode of action in avian rickets.[2] These authors showed that with irradiated ergosterol, the increase in activity with larger doses is much less per unit than is the case with cod liver oil.

We may look at the question in another way. If we divide some of the more often quoted reports on the anticaries action of vitamin D in children of school age into two groups, according to favorable and less favorable results, we find that this also divides them rather clearly according to the type of vitamin employed. Using irradiated ergosterol, Day and Sedwick reported inconclusive, if not negative results.[11] Anderson and his co-workers found the mean caries incidence slightly reduced by administration of 1,000 units of irradiated ergosterol, but they state that the difference is not statistically significant.[5] This statement refers to the group of children of ages comparable to those covered in this report. In the preschool children, the same amount of supplement represented, of course, a larger per kilogram dose, and the effect, though not great, was statistically significant. In our own studies, which now comprise four groups totaling about 120 children given supplements of irradiated ergosterol, the effect, while always measurable, was uniformly unfavorable when compared with those from cod-liver oil therapy. On the other hand, Boyd and Drain reported striking results from the use of cod liver oil.[3, 4] Incidentally, it may be noted that recalcification or rehardening of the dentin by dietary means, which is one of their principal criteria, has been experimentally verified by Sognnaes.[12] In agreement with Boyd and Drain, those of our groups, in this as well as in previous studies, who received vitamin D as cod liver oil or prepared from cod liver oil showed unmistakable improvement according to the dose given. Of distinct interest in this connection are the conclusions of East and Kaiser to the effect that production of vitamin D in the body by sunlight reflects itself in the caries record of communities in the sense that the more adequate the available sunlight of a given

region, the lower the caries.[13, 14] The vitamin D concerned in this process is, of course, not formed from ergosterol, but has the chemical type structure of the form which characterizes cod liver oil.[16]

SUMMARY

1. Five groups of about forty children each were observed under conditions as nearly identical as possible during one school year, with no changes in diet except the addition of vitamin D to the milk of four of the groups through the dispersing medium of chocolate syrup.

(It is admitted that the vitamin D groups had more chocolate and sugar than the control group had. However, there is no reason to believe that the consumption of extra chocolate or sugar contributed significantly to the observed anticaries effect.)

2. The control group showed an increase of 4.50 new carious surfaces per child during this time. In the group receiving a daily supplement of 400 units from cod liver oil, there were 2.48 new carious surfaces per child. The maximum effect obtained in this study (a reduction to 1.65 new carious tooth surfaces) was shown in the group receiving a daily supplement of 800 units of cod liver oil vitamin D per child.

3. This result was not duplicated by the use of even larger amounts of irradiated ergosterol (viosterol), which was given in the same manner (equal dispersion in milk) as the cod liver oil preparation. Administration of 800 units of irradiated ergosterol reduced the caries count to 2.48, and with 3,200 units, there was an insignificant further reduction.

4. These data confirm previous reports, and attention is directed to the fact that the divergent behavior of viosterol with regard to the size of the dose and effect achieved closely parallels that observed under other known conditions, in which its effect per USP unit does not equal that of cod liver oil.

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A BACTERIOLOGIC EVALUATION OF SOME SIMPLE STERILIZING METHODS

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VARIOUS methods have been employed for the destruction of microorganisms. The ideal method still is the use of moist heat for suitable periods of time, either as steam under pressure (the autoclave) or boiling water (the instrument sterilizer). The clinical emergency may find such methods impractical, owing to the time factor involved, unless the dental office possesses a sufficient number of instruments and maintains them in an aseptic condition. The cleaning of root canals may be such an emergency. Prevention of extension of infection through the apex requires, in addition to a skilful technic, the employment of a number of previously sterilized files or the frequent resterilization of the several files in use. This study was undertaken to determine whether some simple methods advocated for sterilization possessed definite value. Results with *Staphylococcus aureus* indicated no superiority of one method over another. It was therefore decided to employ a more critical criterion, namely the destruction of *B. subtilis* spores, as a means of determining the efficiency of (1) the flame; (2) alcohol and the flame; (3) formalin-alcohol and the flame; (4) benzene, phenol, alcohol and boiling water, each used thirty seconds, and (5) the Flaherty molten metal sterilizer.

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Read before the International Association for Dental Research, New York, N. Y., March 14, 1942.

METHOD

Suspensions of *B. subtilis* spores were prepared by emulsifying the growth of agar slants, several weeks old, in a sterile physiologic sodium chloride solution. The presence of spores was determined by microscopic examination. Small iron screws were immersed in these suspensions for at least ten minutes and then removed and allowed to dry about a half hour. Only plain iron screws were used, since either cadmium coated or brass screws exert in themselves a bacteriostatic action. Screws were employed because of their low cost and relatively large surface area.

The treated screws were then individually exposed to the sterilizing procedures mentioned. Subsequently, they were dropped, by means of sterile forceps, into tubes of broth and incubated for forty-eight hours. Turbidity of the broth was no indication of growth since oxidation of the screws caused cloudiness of the broth. All broth tubes were therefore subcultured to agar plates. Tests were run on different days with different suspensions of *B. subtilis* spores. The five sterilizing methods were always tested in series at the same time so that all would be exposed to the same technical conditions and each would serve as a control for the other.

Passage Through the Flame.—Screws covered with *B. subtilis* spores were passed through the flame three, six, ten, fifteen and twenty times respectively. Since the beaks of the forceps cover a small area of the screw and possibly could protect some spores thereon, the

beaks were always heated until they became red before the screw was grasped and passed through the flame. The results are given in the accompanying table.

Alcohol and the Flame.—Treated screws were immersed in 95 per cent ethyl alcohol and removed immediately, and the alcohol was ignited, the results are indicated in the table.

Formalin, Alcohol and the Flame.—Sanderson,[1] in 1922, found that a mixture of one part formalin (40 per cent formaldehyde) and 3 parts 95 per cent alcohol when ignited caused destruction of spore-bearing bacilli present on instruments in more than 90 per cent of tests. Results previously reported by one of us,[2] as well as our present results, corroborate Sanderson's findings, as shown in the table.

Benzene, Phenol, Alcohol and Boiling Water.—Treated screws were immersed for thirty seconds consecutively in each of the following solutions: benzene, concentrated phenol, 95 per cent alcohol and boiling water. This method is employed at a local hospital for sterilizing delicate instruments used in eye surgery. It was found by us to be satisfactory in destroying non-spore formers such as *Staphylococcus aureus*, but of little value in tests with *B. subtilis* spores, as shown in the table.

Flaherty Molten Metal Sterilizer.—Spore-covered screws were immersed in mineral oil and then submerged in molten alloy (melting point 175° C.) for periods of five or ten seconds. The mineral oil was employed only as an aid in preventing adherence of the alloy to the screws. Tests were performed with the alloy heated to various temperatures ranging between 180° C. and 300° C., as shown in the table.

EFFECT OF SIMPLE STERILIZING METHODS ON B. SUBTILIS SPORES

Method	Number Tests	Results		Efficiency Per Cent
		Growth	No Growth	
Times Flamed				
3	3	3	0	0
6	3	3	0	0
10	4	4	0	0
15	20	19	1	5
20	20	3	17	85
95% alcohol and flame	30	27	3	10
40% formalin, 1 part, 95% alcohol, 3 parts	25	2	23	92
Benzene, phenol alcohol, boiling water, each 30 seconds	26	22	4	15.4
Flaherty molten metal sterilizer	68	6	62	91.2

CONCLUSION

Five simple methods of sterilization were evaluated. Moist heat is still considered the most efficient sterilizing agent. However, where conditions render its use impractical, we suggest the employment of either formalin-alcohol and the flame or the Flaherty molten metal sterilizer.

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INJECTION MOLDING OF PLASTICS FOR DENTURES

By WALTER J. PRYOR, D.D.S., Cleveland, Ohio

IT has been the privilege of the dental profession to develop and make available many benefits to health and well-being, benefits so necessary to the present mode of life that it is difficult to imagine the confusion and suffering both physical and mental that would result if these boons suddenly became unavailable. Among the greatest of these was the introduction of plastics in the construction of artificial dentures.

The first of the plastics, a hard rubber, proved so useful that it held its place as the most practical denture base for about one hundred years. However, it had one great shortcoming in that it was a poor imitation of the living tissues of the mouth; and so, in the artistic sense of the dentist, there existed the wish for a plastic that would be lifelike in appearance. Among modern plastics, the acrylic resins have filled this requirement almost completely.

These modern plastics, however, have a shortcoming also in that they exhibit excessive shrinkage while undergoing the change from the plastic to the hard state. This constitutes an offense to the mechanical sense of the dentist, who strives to obtain in the finished denture an exact reproduction of the wax case.

This shrinkage, if not brought under control, manifests itself in marked inaccuracy of the occlusion, porosity and checking of the porcelain teeth. The checking of teeth is produced in much the same way as the splitting of a nut in a cracker, and not, as was first believed, by excessive pressure in the hollow of diatoric teeth, because the plastic is never observed to be forced through the crack as it would be if pressure inside the tooth were the cause.

Flat-sided teeth, bicuspids and molars are the ones that usually become checked because they are more easily caught in the viselike grip of the contracting resin. Spacing these teeth and thus cushioning this grip makes them much less liable to check.

Cracking of anterior teeth through the pin level is probably caused by a sudden jolt of pressure particularly in teeth with a long ridge lap. The foregoing deductions, first brought to our attention by P. B. Taylor, of Western Reserve University Dental School, and now with the U. S. Army, are the most logical yet advanced to explain the checking of teeth.

The problem of correcting this serious fault of shrinkage and consequent internal strain about the teeth had to be solved or the acrylic resins would have passed into the discard, as had the preceding pink plastics.

Two procedures soon put to use made the methyl methacrylate plastic sufficiently practical that it became the most used material in denture construction. However, both of these expedients, although widely used today, have weaknesses which leave much room for improvement.

One of these procedures is the addition of extraneous chemicals to the plastic. Plasticizers, inhibitors or lubricants added or inhibitors painted on the porcelain teeth come under this first heading, while

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crowding an excess of uncured plastic into the mold to compensate for the shrinkage of the curing or polymerizing plastic is the other procedure.

One of the great virtues of methyl methacrylate hailed with its advent was that it required neither plasticizer nor lubricant, since, in the liquid or monomeric form, it acted as its own plasticizer. Taylor found that addition of a plasticizer, such as dibutyl phthalate, to the monomer would prevent checking of the teeth by softening the cured plastic to some extent, but without apparent damage to the finished denture. However, a plasticizer that is volatile can cause the plastic to become brittle with age, as many of the plastics do.

Painting an inhibitor around the porcelain teeth can cause a line of discoloration around the tooth neck.

Cross-polymerization with styrene monomer produces a slower curing, somewhat softer plastic, but one less liable to porosity or checking. Many men today who think that they have solved their problem through refinement in technic are getting their result by the use of products that are, usually without their knowledge, adulterated. These additions are often made by the laboratories even when using the highest priced plastics, to insure themselves against the need for "make-overs," which are ruinous to their business.

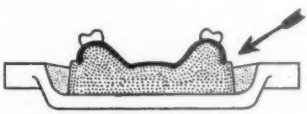

Fig. 1.—Method of investing cast to produce sealed mold.

Our knowledge of the wear and life of acrylic resin pure or adulterated is not extensive, because of the comparatively short time that they have been in use; and while we cannot state that the foregoing procedures are harmful in the practical sense, we can still question their wisdom because the newer technic makes them unnecessary.

The practice of packing the denture mold overfull and making several careful trial closures, probably combined with the use of an acrylic containing a plasticizer, will produce a fair denture. The occlusion, however, may be somewhat askew, owing to a thick fin of excess plastic or forcing of the teeth into the investing plaster by the vigorous shoulder action of a laboratory hand; and we can question such procedure because a better technic is available.

In quest of a method to bring the denture through the curing process with less change in the occlusion as established on the articulator, I turned to the injection method.

Through the years, this method of curing a denture had a strong appeal to thinking men because it was realized that the closed mold was the perfect mold.

Fig. 2.—Wax sprue attached.

As far back as 1875, several men described apparatus for molding dentures that used the injection principle. The description of these appliances is interesting, but all of them failed to find a place in denture practice because they simply packed the mold, but did not provide for a continuous flow of the plastic under definite spring pressure into the mold during the entire curing process as does the apparatus that I am about to describe.

This continuous injection process produces a pressure hydraulic in nature inside the closed mold, and compensates for excessive shrinkage without at the same time distorting the occlusion. This pressure produces a dense strong plastic free from porosity, and being equalized both inside and outside the porcelain teeth, prevents their checking.

Among the difficulties experienced with the older injection flasks was the displacement of loose teeth out of position in injecting into an empty mold. Another was an exaggeration of shrinkage in the curing denture when a reservoir was placed in the investment and not kept under pressure. Shrinkage of the bulk of material in the reservoir would sometimes draw plastic away from the denture mold.

In earlier experiments with the new type injector flask, I occasionally experienced difficulty, but the trouble was nearly always found to be caused by loss of pressure on the curing case.

This loss of pressure may occur because of: 1. Leakage of plastic from the mold, due to imperfect closing or sealing. 2. Premature curing of the plastic in the reservoir. 3. Failure to increase tension on the spring when the period of active polymerization develops, great shrinkage taking place at this time. Loss of pressure occurs when the heating flask reaches about 175 to 180° F.

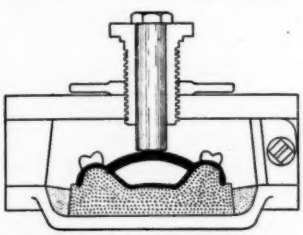

Fig. 3.—Cylinder and piston adjusted to position, which is maintained by means of jam nut.

1. The first of these difficulties was overcome by providing a so-called locked mold. To accomplish this, about three-sixteenths inch of the slightly tapered base of the stone cast is exposed in investing the cast low in the flask. (Fig. 1.)

When poured, the middle section of the investment flows down over this exposed part of the cast, with a telescoping effect. Making sure that no excess of plastic remains on the investment after the one trial closure is another precaution.

The use of only liquid soap as a separator between the two halves of the flask is a further aid in securing a well-sealed mold, since the resulting raw surfaces of plaster are bound together when the flask is bolted shut, and fin formation is thus prevented.

2. To prevent premature curing of the plastic in the reservoir, a number of methods were experimented with, aiming to minimize conduction of heat from the piston to the plastic. Disks of rubber and other nonconductors were helpful, but all methods were discarded in favor of air cooling the injector assembly by a current of air from a small electric fan passing across it during the entire curing time, except the last fifteen minutes, when the case was allowed to boil with the fan removed. Thus the case is properly cured, while the plastic in the reservoir is still somewhat soft. Keeping the water in the boiling pan low enough to cover not more than half of the flask, together with use of the fan, prevents the curing heat from reaching the reservoir.

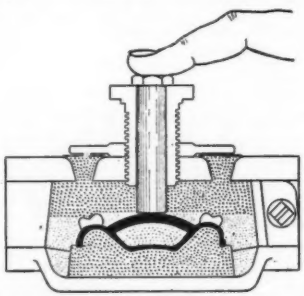

Fig. 4.—Piston tapped down in place when top section of flask is poured.

3. To prevent the third cause of loss of pressure (failure to maintain the pressure), a time set clock is recommended.

It was discovered, in using unvulcanized rubber as a buffer between the piston and the reservoir, that the soft

rubber passed down through the center of the sprues and out into the case. In cross-section, the sprue resembled a cut rose-stalk, the soft rubber resembling the pith. (Fig. 10.) This demonstrates that, after curing has definitely set in, the flow of uncured plastic from the reservoir continues to travel into the interior of the thicker portions of the denture, and never onto the surface as stated by one critic. The same flow of the plastic can be demonstrated by sprinkling a small amount of inhibitor such as hydroquinone on the plastic just under the piston. The plastic with the retarded curing will follow the same course as the soft rubber.

Following this technic with just ordinary precaution makes simple the production of cases excellent in every respect, using the straight unadulterated methyl

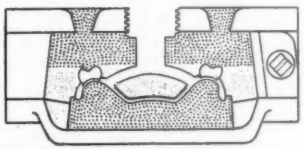

Fig. 5.—Wax boiled out, showing sprue channels and reservoir space in plaster.

methacrylate. The pure acrylic monomer and polymer provides the most severe of all tests of technic, because of its short hardening period and powerful shrinkage.

While the hardening period of straight methyl methacrylate is but seven or eight minutes at temperatures above 180° F., this time may be increased to thirty minutes or more by the use of mixed or altered acrylics; by cross polymerization, the use of inhibitors or copolymerization, or by the use of low heat technic. This may be a three-hour cure at a top heat of 180° F., with half the curing time below this heat, or a five to six hour cure at 160° F. We find that a two hour cure produces very satisfactory results, allowing one and one-half hours gradual heating time to reach boiling temperature, and then boiling for one-half hour. During the last fifteen minutes of boiling time, the electric fan is shut off.

The longer the hardening period of the plastic being used, the less the spring pressure necessary to secure excellent cases. Large sprues also call for less pressure than do small ones.

Plastics packaged in plastic cake form, presumably because they contain an inhibitor to increase their shelf life, should be packed in a warm flask and may require removal of the piston to add more material to the reservoir, because of the air spaces between the separate pieces.

After investment of the case in the lower half of the flask and provision for a locked mold as described heretofore, the waxed case is tinfoiled. A roll of pink base-plate wax about one-fourth inch in diameter is luted to the tinfoil just below

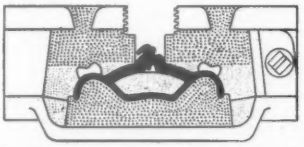

Fig. 6.—Appearance after trial pack.

the first molar tooth at both ends, forming a bridge from right to left. (Fig. 2.) In very heavy cases, an extra roll of wax may be extended to the anterior palatal region.

When melted out, these wax sprues form the gateways to the mold. When the middle section of the flask is poured, the level of the plaster of Paris is brought just to cover the occlusal surfaces of the teeth. With the finger, the plaster is wiped away, the occlusal surfaces being exposed, and also the top of the wax sprue where it arches across from side to side.

The lid of the flask, which has a treaded 1-inch opening in its center, is now placed in position and a bronze cylinder threaded to enter the opening is screwed into place. This cylinder receives a one-half inch piston of stainless steel, which is now placed in the cylinder

and pushed down until it rests on the exposed part of the pink wax sprue. (Fig. 3.) With the piston held down in place, the cylinder is unscrewed until the hex head contacts the shoulder at the head of the piston. The lid is now removed; the remainder of the flask is poured with plaster or stone, and the lid is again pressed firmly to place (Fig. 4.)

When the case is boiled out, the heavy foil is pierced, and the sprue channels located. The foil is cut away from these openings, and, with a sharp knife, a disk of foil about 2 mm. greater in diameter than the sprue opening is removed.

Before boiling out the wax, the cylinder and the piston are removed, there remaining in the investment a hole formed by the piston which will subsequently be used as a reservoir from which plastic is forced into the mold. All frail edges of plaster of Paris are cut away from the openings of the sprue channels before the final washing out of the mold with boiling water. (Fig. 5.)

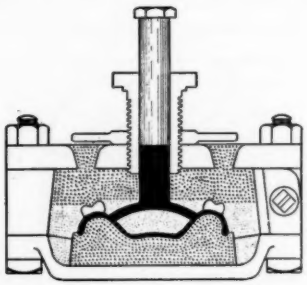

Fig. 7.—Reservoir filled, showing piston protruding 1½ inches beyond cylinder head.

With the plastic of choice mixed according to the directions for that particular material, the case is packed in the usual way, and a trial closure is made. The use of cellophane, first wetted, then dried in a towel, will prevent the plastic from sticking to the cast. A slight underpack is advocated, because if any excess material is squeezed out laterally in the trial closure, it must all be painstakingly cleaned away from the investment in order to permit the two halves of the flask to come together perfectly without any pressure. In using powder and liquid, a cool or only slightly warm flask is favored, because it provides more working time with the plastic. It may be necessary to add more plastic after the trial closure, but the aim should be to have the flask slightly under full. It will be found that, during the trial closure, the plastic has backed up, filling the sprue channels and often the reservoir as well. (Fig. 6.)

The cylinder is now screwed to its originally established position, and enough plastic is packed into it to make the piston, which is now placed, stand out beyond the head of the cylinder for a distance of about 1½ inches. (Fig. 7.) The injector is now attached and the injector screw is turned down until the upper and lower halves of the spring housing come within three-sixteenths inch of contact. (Fig. 8.)

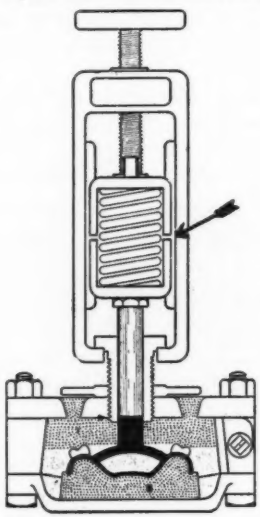

Fig. 8.—Injector attached; spring housing about three-sixteenths inch open.

The case is allowed to stand on the bench for about five minutes, the operator tightening the screw down on the spring so that the two halves of the

spring housing are kept about three-sixteenths inch apart. In very heavy cases, it may be necessary to remove the injector and piston and add more plastic if the piston seems to be penetrating too nearly its full length.

The case is now placed in a pan containing just enough cool water to immerse only the lower one-half of the flask. This precaution is necessary, together with the air cooling with the fan, because the heat must be prevented from reaching the reservoir of acrylic until the last (Fig. 9) in order that it remain plastic, so that maximum results will be assured from the injection process.

The water is heated slowly and, after the temperature has passed 180° F., the opening of the spring housing will indicate a state of rather rapid shrinkage in the curing plastic. The screw is again tightened to keep the material under the desired pressure. The only force permissible in tightening the screw is applied by the thumb and first finger. Excessive pressure beyond that applied through the spring will actually condense the plaster investment, causing a thickening of the palate.

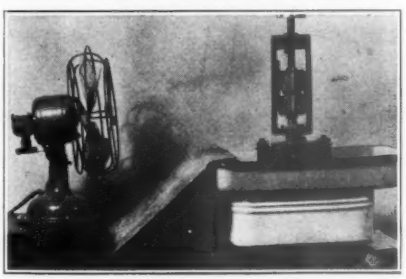

Fig. 9.—Electric fan used to retard curing of plastic in reservoir.

Experience with the particular acrylic being used will dictate to the operator just what pressure is necessary.

There is considerable difference in the working qualities of the various acrylics. A very fine powder will permit much less working time than a coarse powder, and will demand more spring pressure because of the shorter hardening period. The plastics which harden more slowly because of the use of plasticizers, etc., require somewhat less spring pressure.

Permitting the flask to cool slowly on the bench until it reaches room temperature is preferred, but, in any event, it should be allowed to cool fifteen minutes before chilling in water. When thoroughly cooled, the injector and cylinder are removed, the flask is separated and the bolt in the side of the middle section is loosened about one full turn to allow ready removal of the case from the flask.

The investing plaster is carefully removed to avoid any breaking of anterior teeth, and the sprues, after being uncovered, are cut through with a carborundum separating disk in the case of an upper denture. In a lower, it is easier to make the cuts with a saw.

Fig. 10.—Cross-section showing course of uncured plastic down through center of sprue, after outer surface of sprue has hardened.

The operator will be gratified to find that he has produced an excellent denture. The plastic will be dense, strong and tough. There will be almost no fin of excess material, and the occlusal surfaces of the teeth will fit into a previously made plaster index with surprising accuracy. (Figs. 11 and 12.)

In clear cases, the wax sprues are attached a little lower down, so that the sprue channel openings lead to the palate area, which is to be transparent. A piece of block tin, about 24-gage, is placed over each channel opening, to prevent the pink material from entering. The

case is then packed with pink plastic and a trial closure is made. After the open flask is allowed to rest for at least five minutes, to permit the pink plastic to stiffen, the palate portion of the plastic is neatly trimmed away to the extent desired, and the pieces of block tin are removed. The palate portion is then packed with clear material, which is allowed to back up into the reservoir during the second trial closure. More clear plastic is added to the reservoir, the injector is attached and the case is cured.

I routinely use the injection flask in relining all lower dentures, partial or full, because thus there is no danger of disturbing the established occlusion. In

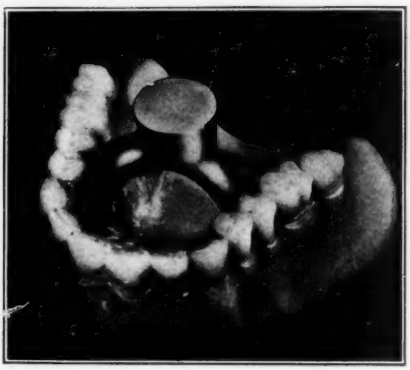

Fig. 11.—Upper case removed from flask.

lower denture relining, the sprues are kept low and a greater amount of the denture is cut away at the point of their entrance.

The case is also invested low in the flask and a short cure is used (about half the regular time) because of the slight bulk of material being cured. I wish to expose the already cured denture to as little heat as possible, because each recuring of methyl methacrylate, as with rubber, produces a slight shrinkage.

To avoid recuring the denture in making a small repair, as when replacing a tooth or two, I heat only the area involved.

The technic for this operation is as follows: The broken tooth is removed and the pin holes are enlarged. A new tooth is ground to fit. A very small amount of freshly mixed acrylic is placed in the pin holes and the tooth seat, and the tooth is firmly pressed to position. The denture is then greased with vaselin and invested in a block of plaster of Paris, only a small area of the denture being left exposed just lingually from the tooth being replaced. A strip of 20-gage copper or brass, one-quarter to one-half inch wide and 6 inches long, is clamped to place against this area with a spring clothespin or a spring clamp. A piece of rubber or sheet of asbestos is placed between the clamp and metal strip (not

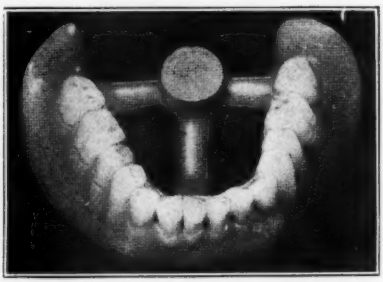

Fig. 12.—Heavy lower case using third sprue.

between the metal strip and the denture) to equalize the pressure.

The other end of the metal strip is placed in the flame of a bunsen burner and heat is conducted through the strip to the small area of repair only. In some of the repairs, a regulation box shaped dovetail is cut just back of the tooth and the clamp pressure is applied to an excess of uncured acrylic material packed at the repair area. By means of this procedure, the denture is heated at the small area of repair only and flasking is unnecessary. (Fig. 13.)

It has been found that only a fraction of the number of repairs are necessary in using methyl methacrylate as were made with hard rubber. Not only the strength and toughness, but also the lightness and

resilience of the material, contribute to this desirable situation.

While dark base-plate rubber in strips may be as strong by test as methyl methacrylate, the finished denture of rubber appears to be weaker, probably owing to the necessity of using a facing of pink rubber on the labial and buccal surfaces of the denture, the pink rubber having neither strength nor durability.

Mention was made of bringing the shrinkage within practical bounds. Numerous tests with heavy lower dentures have shown a shrinkage of only one-third to one-half millimeter measured across the case from second molar to second molar, a definite step having been cut in the molar tooth to facilitate accurate measurement. The upper cases show even

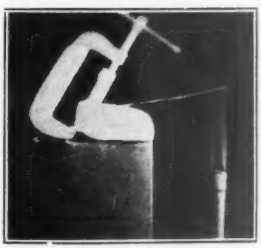

Fig. 13.—Replacing tooth without recuring entire denture; spring clamp for pressure and metal strip used to conduct heat to repair area only.

less shrinkage. While the effort for greater accuracy continues, this technic, I believe, brings the shrinkage well within the bounds necessary for practical application, as it is as good as or better than was obtained with rubber in similar cases.

Slightly greater accuracy can be obtained by curing direct to the stone cast without the use of tinfoil. In fact, the only reason for using tinfoil anywhere in the injector technic is to facilitate removal of the case from the flask and finishing it.

Water absorption of methyl methacrylate, while greater than that of a good elastic base rubber is not of a nature to be observed clinically. It is not a softening or fouling characteristic, as can be observed in pink facing rubber, but rather a slight water imbibition which can be detected only by laboratory analysis. This water imbibition is accompanied by a slight expansion, which partly compensates for shrinkage of the material. It has no practical significance, because the denture is constantly kept wet.

The question is constantly being asked as to whether internal strains may not be introduced into the denture by this method of pressure molding. The answer is that of course strains are introduced, but they are beneficial. These pressure stresses and strains actually overcome the unfavorable internal strains due to shrinkage set up around the por-

Fig. 14.—Experimental base, showing accurate fit.

celain teeth and prevent their breakage. These pressure stresses and strains also compensate for excessive shrinkage and prevent porosity in the denture. Viewed through the polaroscope, clear specimens do show a wavy arrangement of the molecules, as one would expect, but the picture is entirely different from the strains set up by contraction of the plastic about the porcelain teeth. Internal strains are present in every cast, wrought or fused article manufactured, but practical men in industry ignore these strains unless they are unfavorable in nature and cause trouble, such as breakage.

Taylor calls attention to the fact that it is necessary to cure under substantial pressure to produce a good denture base, and that the compressive stresses and strains introduced work in our favor.

Experimental denture bases cured two years ago with the injection flask retain an excellent fit, as can be seen in Figure 14.

CONCLUSIONS

After two years of clinical observation and laboratory experiments with the use of this technic in curing acrylic resins, I have arrived at the following conclusions.

1. Excellent cases can be produced routinely with the occlusion correct within a small fraction of a millimeter.
2. The denture will be tough and strong with almost no breakage in use.
3. Checking of porcelain teeth is eliminated.
4. Porosity is eliminated.
5. Change in form of the denture base is brought well within the bounds of practical demands.
6. These results can be obtained without resorting to adulteration or the use of plasticizers.

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Rose Building.

SOME FUNDAMENTALS OF AMALGAM CAVITY PREPARATION

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IT is axiomatic that before a cavity is prepared for any type of restoration, the operator should have clearly in mind the fundamental mechanical properties of the filling material to be used. Only too frequently, amalgam restorations are condemned, and justifiably so. However, in the majority of cases, failure does not lie in the amalgam filling material, but in a lack of correlation of tooth morphology with the fundamental mechanical properties of amalgam on the part of the operator who prepared the cavity.

The accompanying illustrations are presented to show a few of the fundamentals of amalgam cavity preparation as taught at the University of Minnesota School of Dentistry. The illustrations are divided into three groups: simple cavities, compound cavities and complex cavities.

From the University of Minnesota, Division of Operative Dentistry.

SIMPLE CAVITIES

Many intricate details are frequently overlooked in the preparation of simple occlusal cavities. There are very few cases in which the cavity need not be extended into all the pits and through all the fissures.

Figure 1 shows the sweeping curves of the outline form, with the exception that the mesial and distal walls are cut parallel to the crest of the respective marginal ridge. The retention forms are always placed in dentin under the largest cusps.

Figure 2 illustrates the danger involved when the marginal ridges are undercut, leaving unsupported enamel in the proximal portion of the cavity. The cavity should always be extended through the enamel into dentin, leaving a flat resistant pulpal wall.

A cavity cut at 90° to the cavosurface

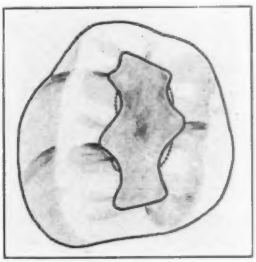

Fig. 1.—Sweeping curves on occlusal cavity.

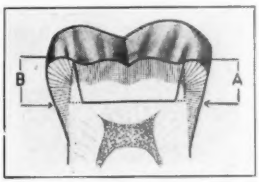

Fig. 2.—Section showing danger of undermining marginal ridge.

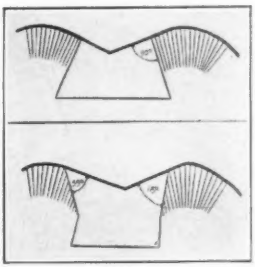

Fig. 3.—Cavity cut at 90° to cavosurface, affording maximum strength for both enamel and amalgam.

(Fig. 3.) affords maximum strength for both the enamel and the amalgam. However, cutting a cavity so that the surrounding walls are at right angles to the pulpal wall insures adequate resistance. Short bevels on the cavosurface angles are to be avoided at all times.

In Figure 4, the fundamental principles described above have been carried out for the occlusal cavity of an upper molar. The distal wall is cut parallel to the crest of the oblique ridge and again the mesial wall is cut parallel to the crest

Fig. 4.—Occlusal cavity on upper molar.

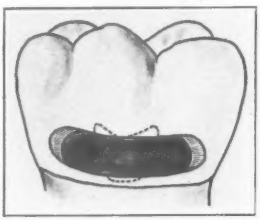

Fig. 5.—Buccal cavity.

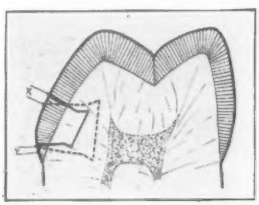

Fig. 6.—Section showing importance of cutting axial wall parallel to buccal surface of tooth.

of the marginal ridge, extending into the mesiobuccal and mesiolingual triangular grooves.

The buccal cavity (Fig. 5.) is usually near the crest of the gingiva and the cavity, when prepared, should extend

slightly under the crest. The mesial and distal extensions depend on the extent of caries. The cavity should be cut to a uniform depth.

Figure 6 illustrates the importance of cutting the axial wall parallel to the buccal surface of the tooth. The enamel rods are cut at right angles to the cavosurface. This procedure eliminates a dark faulty margin at points X and Y. The cavity walls are cut parallel to the natural cleavage lines of the enamel.

The retention forms for buccal cavities should be placed in the occlusal axial line angle and the gingival axial line angle, respectively. Placing the retention forms in the mesial and distal portion frequently undermines caries-susceptible enamel at points AB and A′B′, Figure 7.

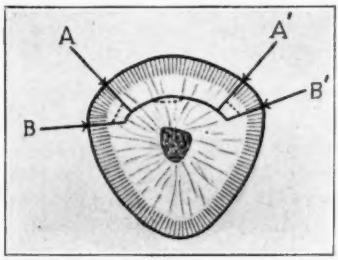

Fig. 7.—Retention form in mesial and distal area of tooth. Placing the retention form here frequently undermines caries susceptible enamel at points A, B, A′ and B′.

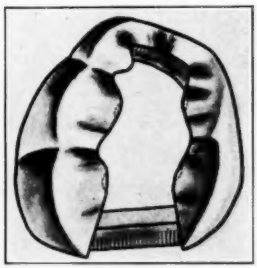

Fig. 8.—Occlusal aspect of mesioclusal cavity on lower right first molar.

Fig. 9.—Beveling back buccal and lingual walls, a common error.

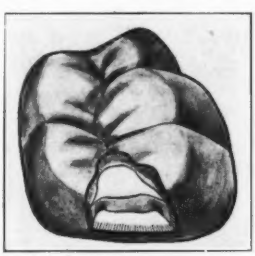

Fig. 10.—Occlusal dovetail. This is of paramount importance.

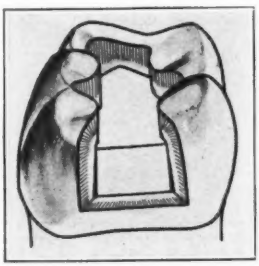

Fig. 11.—Mesioclusal aspect of finished cavity.

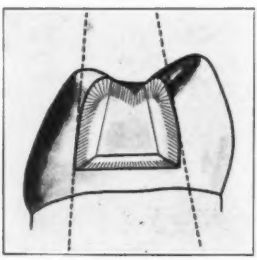

Fig. 12.—Outline form of proximal area in which buccal and lingual walls slightly converge toward occlusal surface.

By neglecting to cut buccal cavities with the axial wall parallel to the buccal surface, the operator frequently encroaches upon the pulp with the retention form. This error, in conjunction with factors in amalgam manipulation, may lead to an embarrassment of the pulp.

COMPOUND CAVITIES

The fundamental principles described

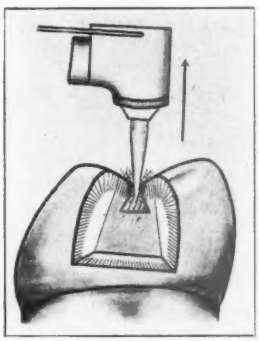

Fig. 13.—Resistance form incorporating factor known as "bulk of amalgam," especially at junction of pulpal wall and axial wall.

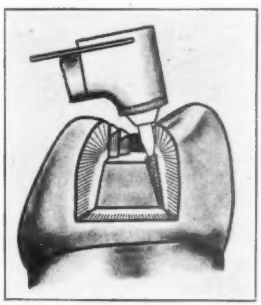

Fig. 14.—Retention prepared with 700 tapering cross-cut fissure bur.

under simple cavities apply to the occlusal area of compound cavities. The fundamental principles of the proximal portion of a cavity are described herewith.

Figure 8 shows extension into the fissures, with the distal wall parallel to the crest of the marginal ridge. From an occlusal aspect, the proximal part of the cavity is as nearly box-shaped as the histologic structure of the tooth will permit.

Too frequently, cavities are not extended sufficiently on the occlusal aspect, but the most common error is beveling back the buccal and lingual walls. (Fig. 9.) Amalgam is definitely contraindicated in this type of cavity preparation.

Figure 10 illustrates an utter disregard

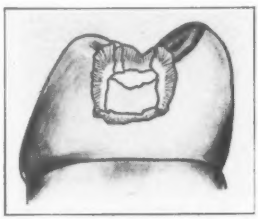

Figure 15.—Artist's conception of poor cavity.

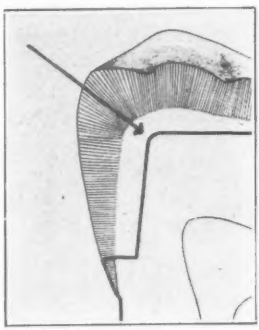

Fig. 16.—Angle (indicated by arrow) which should be rounded.

for the mechanical properties of amalgam. An occlusal dovetail is of paramount importance in all amalgam restorations, although it does not necessarily have to appear in the occlusal outline form in all cases.

Figure 11 presents a mesioclusal aspect of the finished cavity, showing the outline form, resistance form and retention form.

The outline form of the proximal surface (Fig. 12) is such that the buccal and lingual walls slightly converge toward the occlusal surface. The convergence of these walls should not be too sharp because of the weakening effect on the occlusal enamel adjacent to the marginal ridge. The proximal portion is always extended buccolingually to a self-cleansing area.

The resistance form (Fig. 13) incorporates a factor known as "bulk of amalgam," especially at the junction of the pulpal wall and axial wall. This bulk is obtained by starting a bur in the deepest pit of the occlusal surface so as to determine the proper depth of the pulpal wall. An inverted cone should be withdrawn occlusally at intervals to remove the undermined enamel.

The retention form at the mesiobuccal axial and mesiolingual axial acute angle (Fig. 14) is prepared with a 700 tapering cross-cut fissure bur. The bur is directed toward the buccal aspect and toward the lingual aspect, cutting more in the gingival area than in the occlusal area, but not axially toward the pulp. This bur is believed to be easier to control in drawing out these line angles than an inverted cone bur or a round bur. A 000 single cut fissure bur may be used in this retention form also. A gingival margin trimmer is used to finish these retention forms to a definite line angle.

Figure 15 is an artist's conception of a poor cavity preparation. Whether it is actually poor depends on the operating standards to which each individual operator holds himself. Fundamentally, the cavity has everything except finesse.

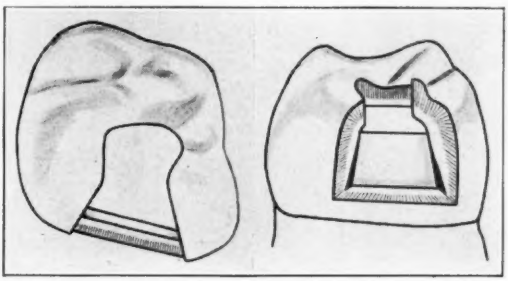

Fig. 17.—Outline of fundamental cavity for upper molars.

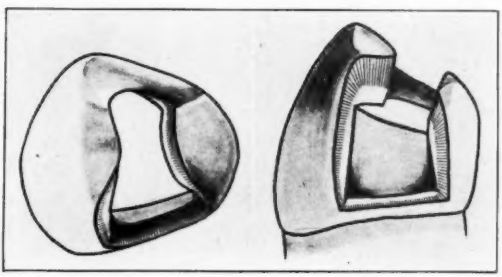

Fig. 18.—Outline of fundamental cavity for lower first bicuspid.

Unfortunately, the illustrations presented thus far incline one to believe that the line angle at the junction of the axial wall and pulpal wall is approximately a right angle. Such is not the case; and in clinical practice also, this very seldom occurs. It is against all prin-

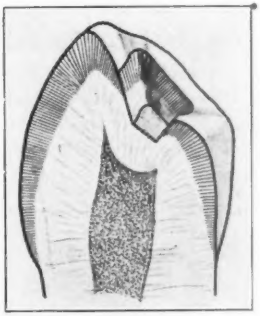

Fig. 19.—Section showing that pulpal wall cannot be cut parallel to gingival wall without involving buccal horn of pulp.

should not be, beveled, but are planed parallel to the natural cleavage lines.

Figure 17 is an outline of the fundamental cavity for upper molars. Variations in this outline form are made in accordance with the histologic structure of the tooth. The distal wall is cut parallel to the crest of the oblique ridge.

The form of the tooth predetermines the outline form in all cavity preparation. The lower first bicuspid, with its diminutive lingual cusp, is a good example. In Figure 18, the pulpal wall is not cut parallel to the gingival wall.

A longitudinal section shows that the

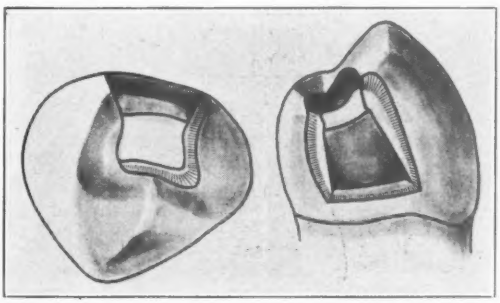

Fig. 20.—Prepared cavity ending at crest of transverse ridge. This is occasionally permissible on lower first bicuspid.

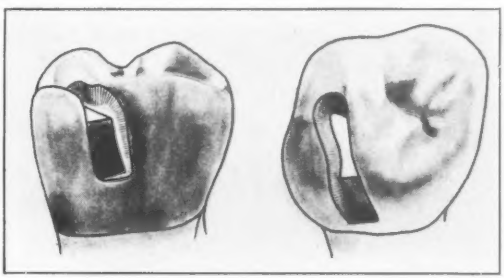

Fig. 21.—Outline of lingual occlusal cavity for upper molars.

ciples of mechanical engineering to create a sharp angle at this junction. Instead, the surface should be rounded as indicated by the arrow in Figure 16, to avoid fracturing the amalgam at this point when it is under stress. The enamel rods at the gingival seat are not, and pulpal wall cannot be cut parallel to the gingival wall without involving the buccal horn of the pulp. (Fig. 19.) Likewise, the lingual pulp horn beneath the diminutive lingual cusp can be avoided by cutting the lingual wall at right angles to the buccoclusogingival curve.

Occasionally, on lower first bicuspids, it is permissible to stop a preparation at the crest of the transverse ridge. (Fig. 20.) This is permitted only when the pits and grooves are very shallow and the patient is relatively caries free.

Figure 21 illustrates another compound cavity which is frequently prepared without allowance for sufficient bulk of amalgam at the junction of the pulpal and axial walls. While the gingival wall is cut flat in this illustration, it may take the curvature of the bur, provided the retention forms in the mesio-axial and disto-axial walls are adequate. The extension on the occlusal surface into the distolingual triangular groove is to be noted.

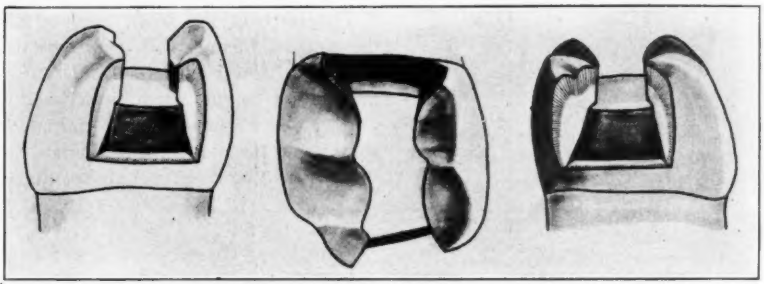

Fig. 22.—Three aspects of mesioclusodistal cavity.

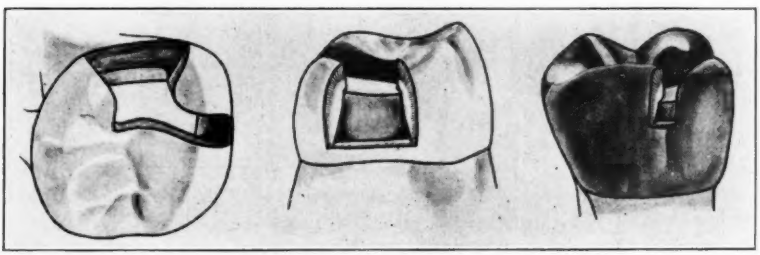

Fig. 23.—Three aspects of complex cavity that can be filled with amalgam.

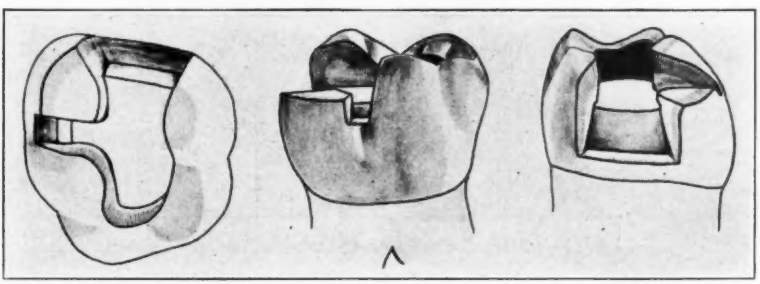

Fig. 24.—Section showing that cusps to be restored should be cut as flat as possible with beveling cavosurface angle.

Many compound cavities are unsatisfactory for an amalgam restoration primarily because they are cut too shallow to afford resistance to masticatory

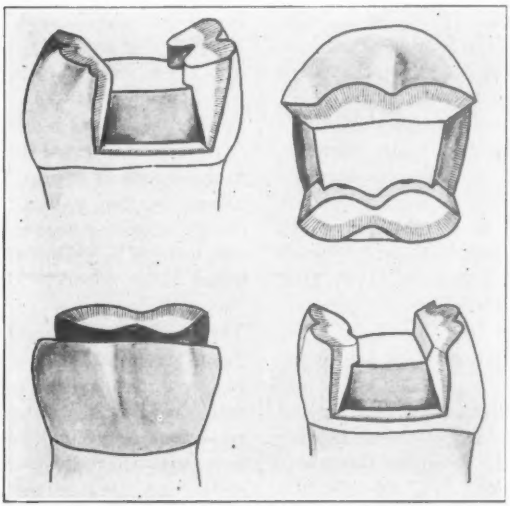

Fig. 25.—Extreme type of cavity for amalgam restoration.

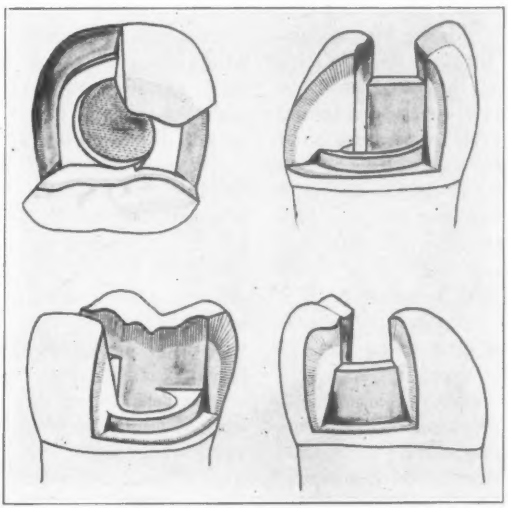

Fig. 26.—Utilizing pulp chamber in part for resistance and retention form.

stresses. The retention form is of secondary importance when the resistance form is correctly prepared.

COMPLEX CAVITIES

All of the fundamental principles outlined thus far apply to complex cavities prepared for amalgam restorations, especially the mesioclusodistal type of cavity involving two contacts. There are many reasons that the preparation and completion of a filling on one proximoclusal surface, followed by the preparation and completion of a filling on the

other proximoclusal surface at a subsequent sitting, is a preferable procedure. One of the chief reasons for advocating the preparation of two compound cavities rather than one complex cavity is that it is possible to obtain adequate separation, which is paramount in restoring contours and contact. Secondary reasons are ease of adaptation of the matrix and the speed with which amalgam can be packed into the cavity after trituration, this enhancing the mechanical properties of the amalgam. Occasionally, a mesioclusodistal cavity has to be prepared.

Figure 22 is an illustration of an mesioclusodistal cavity from three aspects, showing the definite retention forms and the "bulk of amalgam" afforded by this resistance form.

Other types of complex cavities can be treated very satisfactorily with amalgam provided they do not become too extensive. In the lingual aspect of this illustration (Fig. 23), the mesio-axial and disto-axial retention forms are prepared in the same manner as in the compound cavity described in Figure 21.

Occasionally, one is confronted with the problem of restoring a cusp with amalgam. However, there are other materials which lend themselves more readily to this type of restoration. If it is necessary to make this type of restoration (Fig. 24), the cusp to be restored should be cut as flat as possible and without cavosurface bevels, to resist masticatory stress and to insure sufficient "bulk of amalgam." The cusp restoration should never be stopped at the buccal or lingual groove, but should be extended to the adjacent cusp. Failure to extend it results in an amalgam margin in an anatomic groove, and if the amalgam is carved anatomically, the resultant margin of amalgam is weak. Amalgam locks, as illustrated in the buccal aspect of Figure 24, should be employed whenever possible.

The paramount reason for preparing a cavity as illustrated in Figure 25 and filling it with amalgam is lack of financial means by the patient to obtain some other restorative material. Occasionally, one hears the remark that a mesioclusodistal filling restoring all cusps affords a "good" restoration for young people. There is no argument about its being a "good" restoration, but the truth of the matter remains that more tooth structure has to be cut away for an amalgam restoration of this type than would be necessary if the operator were using some other type of restorative material; i.e., an inlay.

Figure 26 illustrates another extreme type of complex restoration. In preparing an amalgam cavity for a tooth in which the root canals have been filled, it is advantageous to utilize the pulp chamber in part for resistance and retention form, especially if one or more cusps are involved. If the cusps are not involved, this procedure is not advocated. The utilization of the entire pulp chamber for retentive resistance is not encouraged, as this procedure complicates any retreatment of the canals. The filling of a cavity, as prepared in Figure 26, with amalgam provides a very satisfactory foundation for a crown abutment.

The purpose of this presentation has been to outline some of the fundamentals upon which restorative work with amalgam is based. At times, compromises will be necessary. If the compromises are at too great a variance with the fundamentals outlined, the preferable procedure is resort to some other restorative material.

USE OF BIOLOGIC FLAPS AND THE ESSER INLAY TO FORM A CHIN AND LIP

By K. W. Penhale, M.D., D.D.S., Chicago, Ill., and J. F. S. Esser, Monaco

A MAN, aged 39, seen May 15, 1941, had been operated on in April 1934 for cancer of the lower lip and chin. The lip had been completely removed, as well as most of the bony structure in the region of the symphysis of the mandible, only the thin inner cortical plate covered with mucous membrane remaining. A radical operation had been performed, destroying the carcinoma by surgery and radium therapy. On examination, there was no evidence of metastasis. (Fig. 1.)

In the past few years, nine attempts had been made to rebuild the chin by the use of tube grafts and pedicle skin flaps from the abdomen and chest. It was evident that at no time had there been a graft sufficiently viable to be successfully transferred to the chin. These failures were probably due to the poor physical condition of the patient. His long hospitalization periods and his inability to masticate food, together with a constant loss of saliva, over many years, were major contributing factors. It was thus obvious that, under the existing conditions, it would be impractical as well as illogical to resort to the previously used pedicle grafts to rebuild his lower lip.

The patient, who was considering suicide, was more than willing to undergo any operation or procedure if he could once more have a lower lip so that he could talk, masticate food properly and walk about without saliva drooling from his mouth, or having to wear gauze and a bandage while in public. The biologic flap was considered the only sure means of solving this difficult problem. We proposed to rebuild the lower lip by means of a bipedicled biologic temporal flap taken from the top of the head. It was to be prepared by the "Esser inlay" method, in order to obtain, on the inside of the future flap, a skin covering to serve as a substitute for the mucous membrane of the future lower lip.

This inlay is used by many plastic surgeons. In the field of oral surgery, it has many uses, and more and more the men in this field will be called upon at least to make the dental compound mold "stent" of the wound. In a book by one of us (J. F. S. E.) published in 1940, the use of the inlay is advocated in general surgery and in surgical branches where it was not previously employed. Dentists may be asked to make molds of body, limb and head wounds for general surgeons who are not experienced in the use of dental compounds. In contrast to the use of the inlay, biologic flaps are rarely used by plastic surgeons and probably such a "biologic flap" as we used in this case has not been employed or its use reported in the United States, since many men in this field mistakenly feel that its technic is perhaps too hazardous. (Fig. 2.)

In "Biological Flaps"[1] the use of pedicles containing veins, lymphatics and nerves (but not skin) is explained. The method is used in all regions of the body, as well as in the facial regions where drainage of the wound is maintained by the many veins and lymph vessels about each artery. In this book, the island flap, a rarely used form of biologic flap, is explained. Gersuny and Dunham were mistakenly credited with having employed a biologic graft; each, in one simple case, using a somewhat similar principle. Gersuny did not mention the island flap method or the fact that the pedicle contained main arteries and nerves. It was impossible for him to have had large blood vessels in the flap that he used, because of its anatomic location, and besides a partial necrosis of the flap proved their absence. Dunham aimed, in his single case, to include the artery in the pedicle. He later returned the pedicle to its

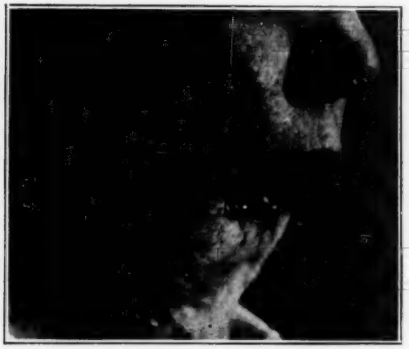

Fig. 1.—Appearance of patient when first seen, May 14, 1941. The central portion of the mandible remaining was covered by scar tissue. The skin of both cheeks was partially destroyed and scarred by radium.

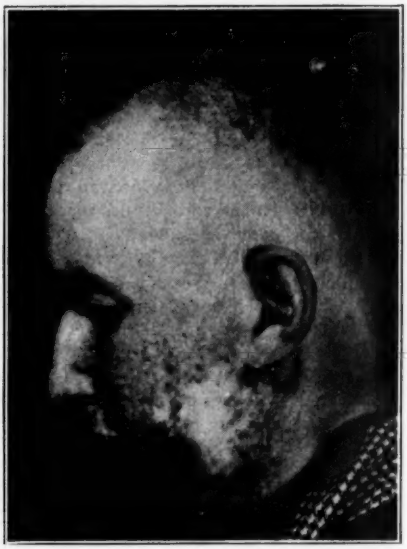

Fig. 2.—Appearance of patient two weeks after inlay technic. The "stent" has been replaced in the entrance of the skin-covered pocket to show its form.

original position. Hradsky, who recently returned from India, showed us, in some curious documents, that the ancient Hindus had used such frontal flaps; a fact mainly of historical interest.

The pedicle of the biologic flap contains mainly veins, lymph vessels and nerves, to-

Fig. 3.—Healed skin graft on scalp partly covered by "stents," which cover new lateral free grafts from thigh.

Fig. 4.—Appearance one month after transfer of flap to new position, with beard from hair of scalp. The large chin pocket reaching to the lower border of the mandible is not yet filled with vulcanite to form a more natural, higher chin.

gether with arteries and the surrounding connective tissue with the exception of the skin. The pedicles remain in their transplanted sutured position, supplying the flaps not only with blood but also with sensation. The

pedicle flaps, not devoid of skin, convey sensations of pain, heat and cold, touch and pressure. Their circulation is more efficient than in their original position owing to the severing of many branches of the main vessels transplanted. (Fig. 3.)

In this case, the main temporal vessels were removed, but were kept in the transplanted skull flap. This flap was first prepared by an "inlay," in order not only to have a future inner skin lining for the flap, but also to obtain an epithelial covering for the skull to replace the flap used for the chin. The first and only incision was made on the top of the head in a line with each ear and to within about 3 inches from the upper border of each ear. This incision, forming the posterior border, was made down to the deep fasia covering the periostium of the skull. A pocket was then made by blunt dissection, in width to correspond with the width desired for the future epithelium-lined lower lip, and in length to correspond with the desired height of the flap, and of the future lower lip and chin. A free intermediate skin graft taken from the thigh was placed over the entering border of the stent with its raw surface outward to completely envelop the compound. The stent, now with its skin covering, was inserted back in the original pocket from which it was prepared. The incision was closed with wire tension sutures to prevent bleeding and secretion between wound and graft and a light pressure bandage was applied.

After seven days, when the stent was carefully removed, the epithelium was attached everywhere to the raw surface lining of the pocket. Sterile vaselin gauze was now inserted to keep the epithelial surfaces separated from each other. After about two weeks of healing and strengthening of the free graft, the flap was ready for transplantation. At this time, the flap with its thin pedicles was elevated free of the scalp. The exposed remaining raw triangular areas above each ear were covered with free split skin grafts taken from the opposite thigh. The flap with its two pedicles were now rotated downward to cover the exposed chin and to make the future new lower lip. In preparation, incisions were made on each side of the face from the base of the pedicle in front of

Fig. 5.—Patient five months after transfer of flaps.

Fig. 6.—Patient with dental restorations in place.

the ear to and under the chin. (Fig. 4.)

The skin edges were freed along the cheeks and along the base of the mandible. The scar on the anterior surface of the center of the mandible remained. The flap was now sutured to the skin on the under surface of the chin and along the skin edges of the cheeks, and the protecting borders were closed over the pedicles. A small amount of the inner epithelial lining of the flap was removed along its inferior surface, the lower border of the flap remaining in contact with the raw surface along the lower border of the mandible.

These sutures were of fine wire to prevent saliva, tears and foreign material from penetrating to the depths of the sutures. The secondary scalp defects were diminished by tension wire sutures. No bandages or dressings were applied except on the head where a pressure bandage was applied over the stent, covering the new skin grafts on the sides of the scalp. Repair was uneventful, with not the slightest evidence of necrosis. (Fig. 5.)

At present, the physical well being of the patient is much improved, while his mental health and happiness are indescribable.

Such biologic flaps, with thin pedicles, not only assure the life of the flap, but also preserve the nerve and blood supply and lymph drainage to such an extent that undernourished adjacent tissues are restored to greater vitality, as in this case, in which radium therapy had partially obliterated the capillaries.

Metal sutures for most plastic work and for general immobilization are perhaps contributing factors in the excellent statistics for use of the Esser grafts during the World War, metal sutures being introduced in such cases in 1915. The clinic of Bier in Berlin adopted wire sutures for certain uses on a large scale in general surgery after learning of their advantages.

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55 East Washington Street.

STUDIES ON DENTAL CARIES

XIII. EFFECT OF AMMONIACAL SILVER NITRATE ON CARIES IN THE FIRST PERMANENT MOLAR*

By HENRY KLEIN, D.D.S., Sc.D., and JOHN W. KNUTSON, D.D.S., Dr.P.H., Bethesda, Md.

INTRODUCTION

SINCE the etiology of dental caries is unknown, a rational method for preventing caries is yet to be developed. However, past experience indicates that the use of procedures based wholly on empiric reasoning has made possible prophylaxis and therapy even before the causative agents were fully known (in scurvy, malaria, rickets and other disease). Because of these precedents, investigators have attempted to develop and test empiric methods which give promise of preventing and arresting caries. Among such procedures is topical application of silver nitrate.

PREVIOUS STUDIES

In spite of the prevailing impression that silver nitrate possesses caries-prophylactic and caries-arresting properties, available reports contain few quantitative data on the subject. In 1891, Stebbins[1] suggested that silver nitrate be used for arresting caries, and later Frank[2]

*From the Division of Public Health Methods, National Institute of Health, U. S. Public Health Service.

suggested its use for the prophylaxis of caries. Miller, on the basis of *in vitro* experiments, concludes:

Silver nitrate applied to cavities of decay, has a more or less pronounced effect in arresting the progress of the disease. The protection offered is naturally only partial and varies in degree in different cases. . . . These results leave much room for doubt as to whether the advantage gained by the use of silver nitrate for prophylactic purposes (if there be any at all) is sufficient to offset its very considerable disadvantages both as to its escharotic and poisonous properties as well as to the discolorations produced by it.[3]

Prime, a recent advocate of ammoniacal silver nitrate (Howe's solution), states: "If it is applied before the surface is etched, it seems to prevent the etching."[4] Although it is not specifically indicated, the quotation probably refers to the proximal surfaces and would thus allow the inference to be drawn that ammoniacal silver nitrate possesses definite caries-prophylactic properties when applied to these surfaces. In discussing the caries-arresting qualities of the chemical, Prime says:

We tried ammoniacal silver nitrate. . . . The real surprise came when time proved that the great majority of the surfaces treated did not require fillings. . . . If the condition has progressed to the point of cavitation, if the decay can be felt with the explorer tine, and can be seen in the x-ray film, it is too far advanced to expect best results.[5]

According to Prime, silver nitrate will arrest only what he terms "invisible caries," the presence of which can be discerned only through applying the chemical. With regard to its efficacy when used on surfaces containing pits and fissures, he says:

Fillings are the only satisfactory means for dealing with pits and fissures. I believe in and practice filling them early, if possible, in the pre-carious stage—prophylactic odontotomy.[5]

Hoffman discusses the records of fifty-six of Prime's cases, in each of which ammoniacal silver nitrate had been applied repeatedly to "proximal incipient caries" at intervals ranging from approximately three to more than six months for periods up to 6 years. He writes:

The total number of etched (minimal carious) areas thus treated was 887; the total number of treatments was 5,304—approximately six per carious surface. Caries was arrested in every case.[6]

TABLE 1.—AGE AND SEX DISTRIBUTION OF 474 SCHOOL CHILDREN INCLUDED IN SILVER NITRATE STUDY

Sex	Age at Last Birthday (1937)									
	4	5	6	7	8	9	10	11	12	All Ages
Male	1	11	83	73	40	24	4	2	1	239
Female		13	75	84	49	14				235
Both sexes	1	24	158	157	89	38	4	2	1	474

None of the several reports includes material on controls; that is, in none of them are quantitative comparisons made of treated and untreated teeth. In this connection, Prime writes:

A private practice does not lend itself to controls. Our patients object to applying it on one side only, allowing the control side to go untreated. . . . All dentists who do operative work are invited to join in the study. . . . Record exact location where treatment is applied. Treat one side only, keeping other side for control. Advise no change in mouth care or food habits. This will tend to prove the merits of the treatment.[7]

PURPOSE AND SCOPE OF THE PRESENT STUDY

It is clear, therefore, that there is need

for a critical evaluation of the efficacy of silver nitrate as a caries-prophylactic. In designing a study to accomplish this purpose, it would be desirable to determine its effects on all the coronal surfaces of each of the different morphologic types of permanent teeth. The experiment described in the present report deals, however, only with the surfaces of the first permanent molar. The decision to test the utility of the chemical on the surfaces of the molar was predicated on the clearly established fact that caries in this tooth forms a major public health dental problem. The molars are known to be the most susceptible teeth in the permanent dentition.[8] Among elementary school children, more than 75 per cent of all the permanent tooth surfaces showing evidence of caries attack are in the first permanent molars.[9] (A tooth or tooth surface which shows evidence of a caries attack is one which has unfilled carious areas or which has been filled, or one which is missing from the mouth through extraction, presumably because of caries.)

Because of the present acute need for a method of preventing and controlling caries in the molars, it becomes imperative that the utility of ammoniacal silver nitrate be carefully assayed for these highly vulnerable teeth. The present study was set up for this purpose and in such a way that quantitative information could be obtained on two questions:

1. Will repeated topical applications of ammoniacal silver nitrate prevent the initiation of caries when the chemical is applied to all the surfaces of caries-free first permanent molars?

2. Will repeated topical applications of ammoniacal silver nitrate on carious surfaces of first permanent molars prevent the extension of the carious lesions?

These two questions are the only concern of the present study. The observations recorded and the conclusions drawn have no direct bearing on other uses of silver nitrate, such as its use on the deciduous teeth, for sterilization of cavities in which fillings are to be placed; in the alleviation of pain in pulpitis, and in the reduction of hypersensitiveness of denuded cementum in pyorrhea pockets; or in teeth other than the first permanent molar.

TABLE 2.—CONDITION OF TREATED (T) AND CONTROL (C) FIRST PERMANENT MOLARS IN 1937, NUMBERS AND PERCENTAGES BASED ON DENTAL EXAMINATIONS OF 474 SCHOOL CHILDREN

Condition in 1937	First Permanent Molars											
	Number						Percentage					
	Maxillary		Mandibular		Both		Maxillary		Mandibular		Both	
	T	C	T	C	T	C	T	C	T	C	T	C
Unerupted	77	76	65	66	142	142	16.3	16.1	14.2	14.3	15.3	15.2
Caries-free	301	320	253	276	554	596	64.0	67.8	55.1	60.0	59.6	63.9
Carious, one surface	76	61	109	95	185	156	16.2	12.9	23.7	20.7	19.9	16.7
Carious, two surfaces*	16	15	32	23	48	38	3.4	3.2	7.0	5.0	5.2	4.2
Total	470	472	459	460	929	932	100.0	100.0	100.0	100.0	100.0	100.0

*Thirty-five molars, nineteen among the T group and sixteen among the C group, have been omitted from the analysis, since they showed carious lesions in three or more surfaces or were filled or extracted.

EXPERIMENTAL PROCEDURE

The subjects used in the present experiment were approximately 700 unselected white children, the majority of whom were enrolled in the first grade of

elementary school. In September 1937, each child was given a complete dental examination and ammoniacal silver nitrate was applied to the right maxillary first permanent molar and the left mandibular first molar. The first molars on the opposite sides of the mouth, that is the left maxillary first molar and the right mandibular first molar, were not treated and thus served as controls. In September 1938, and again in September 1939, as many of the original group of children as could be found were re-examined and the same teeth re-treated.

In the spring of 1941, the children were again called in and complete dental examinations were made. At that time, approximately four and one-half years after the beginning of the experiment, 474 out of the original group were examined. This group of 474 children, shown by sex and age in Table 1, were, therefore, those that had been followed throughout the experimental period.

Because some of these subjects were relatively young, the first permanent molars had not erupted in all 474 children. Those molars which erupted after the beginning of the experiment were nevertheless included in the experiment. Hence, although most of the first molars specified for treatment were erupted in 1937 and therefore were treated three times, those which erupted between the

TABLE 3.—CONDITION, IN 1941, OF TREATED (T) AND CONTROL (C) FIRST PERMANENT MOLARS WHICH SHOWED SPECIFIED CONDITIONS IN 1937, NUMBERS AND PERCENTAGE BASED ON DENTAL EXAMINATIONS OF 474 SCHOOL CHILDREN

Condition and Year		First Permanent Molars											
		Number						Percentage*					
		Maxillary		Mandibular		Both		Maxillary		Mandibular		Both	
1937	1941	T	C	T	C	T	C	T	C	T	C	T	C
Unerupted	Caries-free	21	36	16	19	37	55	27.3	47.4	24.6	28.8	26.1	38.7
	One or more surfaces attacked by caries	56	40	49	47	105	87	72.7	52.6	75.4	71.2	73.9	61.3
Caries-free	Caries-free	55	84	59	51	114	135	18.3	26.2	23.3	18.5	20.6	22.7
	One or more surfaces attacked by caries	246	236	194	225	440	461	81.7	73.8	76.7	81.5	79.4	77.3
Carious, one surface	One surface attacked by caries	28	23	18	10	46	33	36.8	37.7	16.5	10.5	24.9	21.2
	Two or more surfaces attacked by caries	48	38	91	85	139	123	63.2	62.3	83.5	89.5	75.1	78.8
Carious, two surfaces†	Two surfaces attacked by caries	7	4	3	4	10	8	43.7	26.7	9.4	17.4	20.8	21.1
	Three or more surfaces by caries	9	11	29	19	38	30	56.3	73.3	90.6	82.6	79.2	78.9

*Thirty-five molars, nineteen among the T group and sixteen among the C group, have been omitted from the analysis, since they showed carious lesions on three or more surfaces or were filled or extracted.

†The number of teeth showing specified conditions in 1937, and on which the percentages are based, are shown in Table 2.

first and second treatment dates had only two applications of silver nitrate, while those which erupted after the second treatment, but before the third had only one application. Two maxillary right molars which were unerupted in 1939 received no treatment although they are included in the treatment group.

Among the molars erupted in 1937 and specified for treatment, nineteen were excluded from the analysis because they were extracted or filled or had extensive caries on three or more surfaces. Among the molars erupted in 1937 and specified as controls, sixteen were excluded for the same reasons.

Technic of Application.—The first molars, each time they were treated, were isolated with cotton rolls and all the coronal surfaces were thoroughly dried. Ammoniacal silver nitrate was applied to the occlusal and proximal surfaces, the buccal groove and pit in the mandibular molars and the lingual groove and buccal surface of the maxillary molars. Approximately one minute after the silver nitrate had been applied, eugenol was spread over the treated surfaces. About thirty seconds later, the excess was wiped away with a large cotton pellet. The chemical was applied to the molars specified for treatment regardless of whether they showed carious lesions. Treated molars are designated in this

TABLE 4.—CARIOUS CONDITION, IN 1941, OF TREATED (T) AND CONTROL (C) FIRST PERMANENT MOLARS, SHOWING SPECIFIED CONDITIONS IN 1937, NUMBERS AND PERCENTAGES BASED ON DENTAL EXAMINATIONS OF 474 SCHOOL CHILDREN

Condition in 1937	Attacked by Caries in 1941	First Permanent Molars											
		Number						Percentage*					
		Maxillary		Mandibular		Both		Maxillary		Mandibular		Both	
		T	C	T	C	T	C	T	C	T	C	T	C
Unerupted	One surface	42	32	19	21	61	53	54.5	42.1	29.2	31.8	43.0	37.3
	Two surfaces	13	7	17	15	30	22	16.9	9.2	26.2	22.7	21.1	15.5
	Three surfaces		1	5	4	5	5		1.3	7.7	6.1	3.5	3.5
	Four or five surfaces	1		8	7	9	7	1.3		12.3	10.6	6.3	5.0
	One or more surfaces	56	40	49	47	105	87	72.7	52.6	75.4	71.2	73.9	61.3
Caries-free	One surface	149	163	78	97	227	260	49.5	50.9	30.8	35.1	41.0	43.6
	Two surfaces	73	51	64	78	137	129	24.3	15.9	25.3	28.3	24.7	21.6
	Three surfaces	11	11	23	22	34	33	3.6	3.4	9.1	8.0	6.1	5.5
	Four or five surfaces	13	11	29	28	42	39	4.3	3.4	11.5	10.1	7.6	6.5
	One or more surfaces	246	236	194	225	440	461	81.7	73.8	76.7	81.5	79.4	77.3
Carious, one surface	Two surfaces	15	13	23	15	38	28	19.7	21.3	21.1	15.8	20.5	17.9
	Three surfaces	13	7	7	10	20	17	17.1	11.5	6.4	10.5	10.8	10.9
	Four or five surfaces	20	18	61	60	81	78	26.3	29.5	56.0	63.2	43.8	50.0
	Two or more surfaces	48	38	91	85	139	123	63.2	62.3	83.5	89.5	75.1	78.8
Carious, two surfaces†	Three surfaces	1	3	1	1	2	4	6.3	20.0	3.1	4.3	4.2	10.5
	Four or five surfaces	8	8	28	18	36	26	50.0	53.3	87.5	78.3	75.0	68.4
	Three or more surfaces	9	11	29	19	38	30	56.3	73.3	90.6	82.6	79.2	78.9

*The number of teeth showing specified conditions in 1937, and on which the percentages are based, are shown in Table 2.

†Thirty-five molars, nineteen among the T group and sixteen among the C group, have been omitted from the analysis, since they showed carious lesions on three or more surfaces or were filled or extracted.

report by T and the controls by C.

In the study, no attempt was made at the time of treatment to direct the children to facilities where they might have received reparative dental service. Under these circumstances, some teeth had been filled, and a few more extracted in the children who had voluntarily visited dentists in the community during the observation interval.

ANALYSIS

Condition of the Molars at the Beginning of Experiment (1937).—The status of the treated and control molars at the beginning of the study in 1937 is shown by the data in Table 2.

The similarity of the two groups of molars in 1937 is shown by the fact that 15.3 per cent of the T group and 15.2 per cent of the C group were unerupted; 59.6 and 63.9 per cent, respectively, were caries-free; 19.9 and 16.7 per cent, respectively, showed one unfilled carious surface, and 5.2 per cent of the treated group and 4.2 per cent of their controls showed unfilled caries on two surfaces.

Condition of the Molars at the End of Experiment (1941).—The status of the treated and control molars, as observed in 1941, is given in Tables 3 and 4. From these tables, it becomes evident that the caries-free and carious first permanent molars treated with silver nitrate are attacked by caries in much the same manner as their respective caries-free and carious controls which were not given the silver nitrate treatment.

Condition in 1941 of Molars Which Were Unerupted or Caries-Free at the Beginning of the Experiment.—From the material given in Table 3, it may be noted that among the molars unerupted in 1937, to which silver nitrate was applied after eruption in 1938 and in 1939, 73.9 per cent had been attacked by caries by 1941. Of their controls, 61.3 per cent had been attacked over the same interval. Among the molars that were caries-free in 1937, 79.4 per cent of the treated and 77.3 per cent of their controls were attacked by 1941.

The extent to which caries involved these particular categories of treated and control molars is shown in Table 4. Approximately equal percentages of the treated and control molars caries-free or unerupted in 1937 had two surfaces attacked, and similar percentages showed three, four or five surfaces attacked by 1941.

Condition in 1941 of Molars Which Were Carious at the Beginning of the Experiment.—The material given in Table 3 indicates that, of the molars showing one carious surface in 1937, 75.1 per cent of the treated and 78.8 per cent of their controls showed extension of the original carious condition over two or more surfaces. Of the molars showing two carious surfaces in 1937, 79.2 per cent of the treated and 78.9 per cent of their controls showed extension of the original two-surface caries to three or more surfaces.

The degree to which the treated and control molars showed extension of caries is shown in Table 4. Among the molars with one carious surface in 1937, 20.5 per cent of the treated and 17.9 per cent of the controls showed extension to two surfaces by 1941, while about equal percentages of the treated teeth and controls showed extension to three, four or five surfaces by 1941. In the treated and control molars with two carious surfaces in 1937, the percentage showing extension of the original carious condition to three surfaces was somewhat higher for the controls (10.5) than for the treated (4.2). On the other hand, the percentage showing extension to four or five surfaces was higher in the treated molars (75.0) than in their controls (68.4).

In substance, it is apparent from the foregoing discussion that:

1. The molars specified for treatment were, in 1937, very similar in their caries-experience to those designated as controls.

2. Likewise, after silver nitrate had been applied to the molars in the T group one or more times over an interval of four and one-half years, much the same situation prevailed. The difference in the percentages of treated and control teeth attacked by caries or showing extension of carious lesions was, in the main, small and inconsistent; the larger difference appearing at least to indicate that the treated molars suffered the greater caries.

COMMENT

The development of a procedure which the dentist could apply and which would invariably prevent the initiation of caries and limit the extension of existing lesions is very much to be desired. There exists an opinion that these purposes may be accomplished through topical application of ammoniacal silver nitrate. However, conclusive quantitative evidence in support of this view is lacking, since no results derived from adequately controlled experiments have heretofore been reported. In this connection, Prime writes:

> It will require many cases over a period of years to definitely determine the value of the preparation. . . . How long it will keep etchings immune and what it will do in perpetuating immunity on decayed surfaces must yet be proved.[7]

The findings described in the present paper, which are based on controlled experiment, indicate that application of ammoniacal silver nitrate once a year to the coronal surfaces of the first permanent molar does not to any significant degree prevent or arrest caries in this highly susceptible tooth. Evidence which would justify either negative or positive conclusions with respect to the prophylactic and caries-arresting effects of ammoniacal silver nitrate on the other morphologic types of permanent teeth remains to be presented.

SUMMARY

1. Among 474 white school children, ammoniacal silver nitrate (reduced with eugenol) was applied in 1937, 1938 and 1939 to the coronal surfaces of maxillary right and mandibular left first permanent molars. In the same children, maxillary left and mandibular right first permanent molars were not given the treatment and thus these teeth served as controls.

2. The molars caries-free or unerupted in 1937, both those treated with silver nitrate and those not treated, were attacked by caries at approximately the same rate and to about the same degree during the interval, 1937 to 1941.

3. In the molars having one or two carious surfaces in 1937, the original carious condition extended to about the same degree in both those treated with silver nitrate and their controls.

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LOCAL USE OF SULFONAMIDES

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IN a previous report, the results obtained from the local application of sulfanilamide in average uncomplicated extraction cases were described (Journal American Dental Association, August 1940). From the results obtained under controlled conditions, it was concluded that the local application of sulfanilamide in this type of case is not indicated. Subsequent experience in a number of additional cases (Tables 1 and 2) has served to confirm the earlier conclusion. It was pointed out in the previous report that *inter alia* sulfanilamide tends to delay healing. This observation has recently received confirmation. E. M. Bick,[2] from results obtained in a series of controlled clinical cases, concludes:

> The local applications of sulfonamide drugs to wounds of the soft tissues or cleancut operative incisions in which primary suture is indicated retards healing by at least 50 per cent of the time factor, and promotes excessive cutaneous scarring. In extremity surgery this delay in healing time may postpone necessary active motion and massage; in plastic skin repair it may interfere with a cosmetic result. Therefore, unless infection is anticipated because of circumstances of the lesion or of the operation, the use of topical sulfonamide therapy may be an unnecessary burden. However, its use in cases in which infection may be anticipated, such as in wounds contaminated under field conditions, is now almost obligatory.

There are several reports in the dental literature[1, 3, 4, 5, 6, 7, 8] which convey the impression that the use of sulfanilamide, in both complicated and uncomplicated extraction cases, prevents infection, promotes or at any rate does not delay healing and minimizes pain. Taken as a whole, these reports fail to show that adequate control conditions were employed, and hence the statements would appear to be mere clinical impressions. At any rate, further clinical observation on a control basis should be made.

A number of recent reports in medical and dental literature indicate the usefulness of local application of the sulfonamides under certain conditions.[2, 3, 4, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22] These findings indicate that the sulfonamides should be studied in connection with complicated or more unusual extraction cases.

In this report will be described the results obtained in a number of cases which would ordinarily be considered difficult or unusual.

CLASSIFICATION OF CLINICAL MATERIAL

Operative wounds were designated as contaminated when the tissues involved were in either an acute or a subacute state of inflammation, or when, even though the tissues were quiescent, the extent and types of tissue involvement made it necessary to place them in this category. For example, Case 1, Tables 5 and 6, presented a very extensive diffuse abscess of both the upper right and left lateral incisors.

Clean operative wounds were those in cases of chronically involved teeth in which surgical removal was indicated. By surgical removal, I mean the need of exposing the tooth by removal of soft tissue and bone. Because they offered the best choice for control, third molar cases were generally used.

Extractions were considered average, uncomplicated, when the teeth were chronically involved, by caries, abscess or pyorrhea, or when extraction was per-

TABLE 1.—GROUP 1: CONTROL; UNCOMPLICATED EXTRACTION

Case	Sex	Age	Teeth Extracted*	Clinical Condition Before Extraction	Appearance of Tissue Before Extraction	Postoperative Results† Appearance of Clot				
						Pain	Swelling	Adenopathy	24 Hours	72 Hours
1	♂	56	R a-b-c	Pyorrhea	Hemorrhagic	—	—	—	Normal	Normal
2	♂	48	R 6-7	Pyorrhea, exposed trifurcation	Hemorrhagic	X	—	—	Normal	Normal
3	♂	32	R 4	Caries, putrescent pulp	Normal	X	XX	—	Normal	Normal
4	♀	16	L 7	Caries, pulp exposure	Normal	—	XX	—	Normal	Normal
5	♀	4	L 4	Caries, pulp exposure	Normal	—	—	—	Normal	Not seen
6	♂	47	R 4-5-6	Pyorrhea	Hemorrhagic	X	—	—	Normal	Not seen
7	♀	62	L 5-6	Pyorrhea	Normal	XXXX	X	X	Normal	Normal
8	♀	37	L D	Granuloma	Normal	—	—	—	Normal	Normal
9	♂	40	L 6	Diffuse chronic alveolar abscess	Draining sinus	—	XX	—	Normal	Normal
10	♀	62	R 4-5-6	Pyorrhea	Hemorrhagic	X	—	—	Normal	Normal
11	♂	29	R E	Granuloma	Normal	—	—	—	Normal	Normal
12	♂	9	L F	Extensive caries, pulp exposure	Hemorrhagic	X	XX	—	Normal	Normal
13	♀	13	R I	Accidental fracture of root	Normal	—	—	—	Normal	Normal
14	♀	62	L D E	Pyorrhea	Hemorrhagic	—	X	—	Normal	Normal
15	♀	30	RDD	Caries, pulp exposure	Normal	X	X	—	Normal	Normal
16	♂	24	L 2	Need for prothesis	Normal	X	X	—	Normal	Normal
17	♀	16	L E	Granuloma	Normal	XX	XXXX	—	Normal	Normal
18	♂	21	L F	Granuloma	Normal	—	—	—	Hemorrhagic	Hemorrhagic
19	♂	32	L D	Chronic alveolar abscess	Normal	X	—	—	Normal	Normal
20	♂	18	L 8	Inflamed operculum	Inflamed	X	X	—	Normal	Normal
21	♂	20	R 8	Extensive caries	Normal	—	—	—	Normal	Normal
22	♀	53	R 627	Pyorrhea	Hemorrhagic	XX	XX	—	Normal	Normal
23	♂	47	RF-GH	Pyorrhea	Normal	X	—	—	Normal	Normal
24	♂	25	L 8	Extensive caries	Hemorrhagic	—	—	—	Normal	Normal
25	♀	81	R2-3	Pyorrhea	Normal	X	—	—	Not seen	Not seen

*Black's method for indicating teeth. †Degree of pain, swelling and adenopathy: None, —; slight, X; medium, XX; severe, XXX; acute, XXXX.

formed for prosthetic reasons. In these cases, removal of soft tissue and bone was not carried out prior to extraction.

No osteomyelitis, compound fracture or dry socket cases appeared for treatment during the course of this study.

SELECTION OF PATIENTS FOR STUDY

In this new series of clinical tests, a great many more cases than are presented have been under observation. However, single cases, since they do not permit the control necessary for good clinical observation, were eliminated, only those cases which afford the best control being used.

Since the clinical material available was limited, and many cases were eliminated for control purposes, the number reported here is small. However, I have come to believe that the actual number of patients is of secondary value as compared with the methods employed.

Wherever possible, the same patient was used for treatment and as a control. This was done to make possible the evaluation of the results, as to age, sex, resistance, local reaction, systemic reaction and pain. Also, this method permitted a fairer analysis of the effect of surgical trauma on the patient.

PROCEDURE AND TREATMENT OF WOUNDS

All operations were performed under procaine borate anesthesia, except that in Case 10, Table 5, ether was used; and in Case 12, Table 5, Case 12A, Tables 5 and 6, and Cases 6 and 10, Table 5, nitrous oxide was the anesthetic of choice.

A careful operative technic was used. The laws of asepsis were followed wherever possible. Irrigation, débridement, cleansing and irrigation were carried out to reduce to the lowest possible level the presence of foreign material. Sponging in all cases was kept to a minimum.

The use of sulfonamides locally was added to the above procedure in infected wounds. Large masses in the form of cones and tablets were avoided. The drug was used in aqueous, powder or ointment form.

In the treatment of impacted teeth, elevator manipulation was avoided until enough bone had been removed by judicious cutting to permit easy delivery of the tooth. These wounds were not all closed by tight suture. Burlew dry foil was used in some cases, as suggested by Archer.[9]

Average extractions were handled in the usual manner, with a simple elevator and forceps technic.

In antrum involvement, a direct approach through the canine fossa was used, and a tight suture was applied in closing the wound.

INDIVIDUAL CASES

Case 1, Tables 5 and 6, offered an excellent opportunity for study of the local effect of the drug where control could be easily carried out. The extensive diffuse abscesses present had been caused by death of the tooth pulps, the result of extensive synthetic porcelain restorations. The large areas involved were in a posterior and a superior direction from the apices of the roots. The patient was willing to submit to treatment after the purpose was explained to him, and he was told there would be no fee if he cooperated. The operative procedure was as follows:

Right and left sides:

1. Treatment of the root canals at the time of operation.
2. Amputation of the root ends.
3. Removal of as much necrotic tissue as possible with the curet.
4. Thorough irrigation and débridement.
5. Thorough irrigation.
6. Sterilization of the root stump with phenol and alcohol.

Right side:

1. Placing of 10 grains of sulfanilamide powder in the cavity and tight suturing of the wound. (After the

TABLE 2.—SULFAPYRIDINE, SULFANILAMIDE AND SULFATHIAZOLE LOCAL THERAPY; UNCOMPLICATED EXTRACTION

Case	Sex	Age	Teeth Extracted	Clinical Condition Before Extraction	Appearance of Tissue Before Extraction	Postoperative Results* Appearance of Clot				
						Pain	Swelling	Adenopathy	24 Hours	72 Hours
1	♂	56	LA-B-C	Pyorrhea	Hemorrhagic	—	—	—	Normal	Normal
2	♂	48	L3-6	Pyorrhea	Hemorrhagic	XX	X	—	Normal	Normal
3	♀	61	RABLA	Pyorrhea	Normal	XX	X	—	Normal	Not seen
4	♂	27	R7-8	Chronic alveolar abscess	Normal	XXXX	XXXX	X	Hemorrhagic	Hemorrhagic
5	♀	21	L4	Granuloma	Normal	XX	X	X	Hemorrhagic	Normal
6	♂	47	L6	Pyorrhea	Hemorrhagic	X	X	—	Normal	Normal
7	♀	62	LC-D-F	Pyorrhea	Hemorrhagic	XX	XX	—	Normal	Normal
8	♀	31	R6-E	Chronic alveolar abscess	Normal	—	X	—	Normal	Normal
9	♂	24	L8	Caries	Normal	—	XXXX	—	Hemorrhagic	Not seen
10	♂	28	RH	Caries	Normal	—	X	—	Normal	Normal
11	♂	59	LBRB	Pyorrhea	Normal	XXX	XX	XX	Hemorrhagic	Normal
12	♀	42		Granuloma	Normal	X	—	—	Normal	Not seen
13	♀	30	L2	Diffuse alveolar abscess	Normal	—	X	—	Normal	Normal
14	♀	62	R BALA	Pyorrhea	Hemorrhagic	XXX	XX	—	Hemorrhagic	Normal
15	♂	18	L8	Caries	Normal	XX	X	—	Normal	Not seen
16	♂	24	LH	Caries	Normal	—	XX	—	Normal	Normal
17	♀	19	R5	Granuloma	Normal	XXXX	XXXX	X	Hemorrhagic	Normal
18	♀	34	RH	Extensive pocket	Normal	—	—	—	Normal	Not seen
19	♀	34	LH	Extensive pocket	Normal	—	—	—	Normal	Normal
20	♂	18	L8	Caries	Normal	XX	X	—	Normal	Normal
21	♂	20	L8	Caries	Normal	X	XX	—	Normal	Normal
22	♀	53	L4-5-6	Pyorrhea	Hemorrhagic	XXXX	XX	—	Normal	Normal
23	♂	47	L1-2R1-2	Pyorrhea	Hemorrhagic	XX	XX	—	Normal	Normal
24	♀	34	RALA	Need for prosthesis	Normal	—	X	—	Hemorrhagic	Normal
25	♀	22	R4	Chronic alveolar abscess	Normal	XX	—	—	Normal	Not seen

*Degree of pain, swelling and adenopathy: None, —; slight, X; medium, XX; severe, XXX; acute, XXXX.

method suggested by Livingston.) Recovery was uneventful.

Left side:

1. Packing of cavity with petrolatum gauze. The wound was still open and dressings were placed on the eighth day.

The tables indicate the patient's reaction to the different methods of treatment. There was a four weeks' interval between operations on the right and the left sides.

The same method of treatment was employed in the management of all root resection and cyst cases, except that, in those control cases where the cavity was small, the wound was sutured and a small iodoform drain was applied and left in for the first forty-eight hours.

Case 12, Table 5, presented an acute alveolar abscess, which had pointed lingually and which was of about five days' duration. There was a moderate amount of pain, with extensive swelling and adenopathy. The patient appeared somewhat toxic.

Under nitrous oxide anesthesia, the tissue was incised and opened. A large amount of pus was evacuated. The cavity remaining was filled with sulfapyridine powder. Healing was rapid and uneventful.

Case 6, Table 5, that of a diabetic, two days after extraction of the lower left central and lateral incisors presented an acute abscess at the point of needle puncture. The blood clots in the alveoli were necrotic. There was no previous history of infection, although a full-mouth extraction had been carried out in the two months preceding. The teeth extracted were the last two, and because of previous freedom from infection (extraction had been carried out one tooth at a time), the dentist decided to remove the two teeth at the same sitting. Apparently, two extractions were more than the resistance of the patient could stand.

The patient was immediately hospitalized and placed on emergency treatment for diabetics. The abscess was opened under nitrous oxide anesthesia and the necrotic blood clots were removed. Fortunately, a new clot began to form almost immediately. A drain was inserted and the patient was kept in bed, with the usual postoperative care. The pain was severe despite medication. (Table 5.) On the fourth day, sulfonamide therapy was instituted. Sulfathiazole powder was placed in the incised area. The clots were again removed and sulfathiazole was placed in the alveoli and new clots were permitted to form. The drain was replaced to determine whether it had been responsible for the severe pain. The results were dramatic, as indicated in the table. Recovery was rapid and again uneventful.

Case 12A, Tables 5 and 6, presented an acute abscess of the lower right molar, which was impacted. There was severe trismus and the patient suffered from pain and lack of sleep. She was hospitalized and the tissue was incised under nitrous oxide anesthesia. A considerable amount of pus was evacuated. An iodoform drain was inserted and the usual postoperative therapy was begun. Pain, adenopathy and swelling continued, as indicated in the table. The temperature dropped sharply. On the third day, the pain was somewhat controlled with codeine. At this time, the drain was removed; the tissues were opened more widely under nitrous oxide; the cavity was filled with sulfanilamide, and the iodoform gauze drain was placed again to note its effect on the pain. There seemed to be a rapid amelioration of pain, as is indicated in Table 6. There was still a definite adenopathy on the eighth day after sulfanilamide was employed.

Patient 10, Table 5, presented a fracture of the left external oblique ridge and buccal cortical plate. She was in acute pain, with a temperature of 103.2° F., slight swelling on the affected side and the glands of the mandibular group distinctly palpable.

TABLE 3.—CLEAN OPERATIVE WOUNDS; CONTROL*

Case	Sex	Age	Tooth Removed	Postoperative Results													
				First Day			Second Day			Third Day			Fourth Day			Fifth Day		
				Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy
1	♂	23	R 8	X	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
2	♀	31	R H	XX	XXX	—	X	XXX	—	—	XXX	—	—	XXX	—	X	X	—
3	♀	33	R 3	X	XX	—	X	XX	—	X	XX	—	X	—	—	X	—	—
4	♀	26	R 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	♂	22	R 8	—	XX	—	—	XX	—	—	XX	—	—	X	—	—	X	—
6	♂	45	R 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	♀	34	R 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8	♀	30	R H	X	XXX	—	—	XXX	—	—	XXX	—	—	XXX	—	—	XX	—
9	♂	42	R H	X	XX	—	X	XX	—	—	XX	—	—	XX	—	—	XX	—
10	♂	52	R 8	X	X	—	—	X	—	—	X	—	—	—	—	—	—	—
11	♂	23	R 8	—	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
12	♀	27	R 8	X	—	—	—	X	—	—	—	—	—	—	—	—	—	—
13	♂	31	R H	XXXX	XXXX	XX	XX	XXXX	XX	X	XXXX	XX	X	XXXX	—	—	XX	—
14	♂	25	R H	X	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
15	♀	41	R 8	X	X	—	—	X	—	—	X	—	—	X	—	—	X	—
16	♂	52	R H	—	X	—	—	X	—	—	X	—	—	—	—	—	—	—
17	♀	40	R 8	X	—	—	—	—	—	XXX	—	—	—	—	—	—	—	—

*Average temperature of group, 99.8; lowest temperature, normal; highest temperature, 101.7. Any severe pain invariably appeared within the first ten hours after treatment.

The patient was immediately hospitalized and the tissues were incised under ether anesthesia. A necrotic splinter of the external oblique ridge 2.5 cm. in length was removed. In addition, a 2 by 2.5 cm. segment of buccal cortical bone and numerous small fragments of bone were removed. Sulfathiazole powder was placed in the cavity and the wound closed. Recovery was uneventful.

The efficacy of sulfonamide therapy in the cases presented in Tables 5 and 6 appears unmistakable.

In the treatment of third molar wounds, there did not appear to be any advantage in the use of sulfonamides except in Case 13, Table 3, in which, for some reason, the patient suffered acute pain in the first two days in the control cases and only a moderate amount of pain in the treatment group. In Case 17, Table 3, in the control group, severe pain was present on the third day. Careful examination disclosed a fairly large fragment of necrotic bone.

Tables 1 and 2 indicate that, in the treatment of average uncomplicated extractions, the local application of sulfonamides has no beneficial effects.

A careful effort was made, whenever possible, to obtain smears of the type of organisms predominant in the tissues involved and to use that form of sulfonamide which, according to bacteriologic reports,[22, 23] might be most effective. However, it was not possible in most cases to obtain a smear which showed a definite preponderance of one type of organism.

Sulfanilamide, sulfathiazole and sulfapyridine were used according to what was seen on the smears. No difference was noted in the effect of these three drugs.

DISCUSSION

The primary aim in any treatment is to permit Nature to set up her healing mechanism effectively and quickly. As a general rule, when all the rules of asepsis are followed as closely as possible, a good operative technic is used and careful débridement, irrigation and cleansing are carried out, plus the use of a sulfonamide where necessary to control infection, one may expect comparatively little postoperative complication. Generally, there is some edema, little local tissue reaction, a normal temperature and slight or moderate pain and trismus.

Careful débridement and irrigation of all wounds are of the utmost importance. The presence of a tiny spicule of loose bone may result in more postoperative sequelae than the trauma caused during the entire operative precedure. It is better operative procedure, in my opinion, to remove a little more bone with a sharp chisel than to crush and destroy these tissues by instrument manipulation in the removal of the tooth.

Where a sulfonamide was used, the employment of large masses of the drug in the form of cones or tablets was avoided. The presence of such a mass does not permit rapid organization of granulation tissue such as is found in secondary healing.

The drug was applied in one of the three forms, 5 per cent sulfonamide in aquaphor (cholesterinated petrolatum) for application in ointment form; in aqueous solution as a paste, and in powder form. The powder form was most convenient. The drug was placed in blower containers, such as are used for blowing roach powder.[17] The cavity, in all cases, was sponged as dry as possible and the powder blown in, in consideration of the findings of Ivy.[24]

Whenever possible, tight suturing was carried out, and any opening that remained was closed by a dressing. While closure of a wound containing sulfanilamide is not by some considered good practice, the peculiar requirements of dental surgery make it necessary to use some means of holding the drug in place.

I am unconvinced that routine local chemotherapy in clean operative wounds

TABLE 4.—CLEAN OPERATIVE WOUNDS; LOCAL THERAPY

Case	Sex	Age	Tooth Removed	Postoperative Results													
				First Day			Second Day			Third Day			Fourth Day			Fifth Day		
				Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy	Pain	Swelling	Adenopathy
1	♂	23	L 8	X	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
2	♀	31	L H	XX	XXX	X	—	XXX	—	—	XXX	—	—	XXX	—	—	XX	—
3	♀	33	L 3	XX	XX	—	X	XX	—	—	XX	—	—	X	—	—	—	—
4	♀	26	L 8	X	X	—	X	X	—	—	X	—	—	—	—	—	—	—
5	♂	22	L 8	—	XXX	—	—	XXX	—	—	XXX	—	—	X	—	—	—	—
6	♂	45	L 8	X	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7	♀	34	L 8	—	XX	—	—	XX	—	—	XX	—	—	XX	—	—	—	—
8	♀	30	L H	X	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
9	♂	42	L H	XX	XXX	—	X	XXX	—	X	XXX	—	X	XXX	—	—	XXX	—
10	♂	52	L 8	X	X	—	—	X	—	—	X	—	—	X	—	—	—	—
11	♂	53	L 8	XX	X	—	X	XX	—	—	XX	—	—	XX	—	—	X	—
12	♀	27	L 8	X	X	—	—	—	—	—	—	—	—	—	—	—	—	—
13	♂	31	L H	XX	XXX	XX	XX	XX	XX	—	XXX	XX	—	XXX	X	—	XXX	—
14	♂	25	L H	X	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
15	♀	41	L 8	—	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
16	♂	52	L H	X	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—
17	♀	40	L 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

*Highest temperature, 102.3; lowest temperature, normal; average, 100.4.

TABLE 5.—CONTAMINATED OPERATIVE WOUNDS; LOCAL THERAPY

TABLE 5.—CONTAMINATED OPERATIVE WOUNDS; LOCAL THERAPY

Case	Sex	Age	Clinical Condition on Presentation: Diagnosis	Pain	Temperature	Adenopathy	Sulfonamide*	Postoperative Results: First Day Pain	First Day Temperature	First Day Adenopathy	Second Day Pain	Second Day Temperature	Second Day Adenopathy	Third Day Pain	Third Day Temperature	Third Day Adenopathy	Eighth Day Pain	Eighth Day Temperature	Eighth Day Adenopathy
1	♂	25	Diffuse abscess R2	—	—	—	S	—	99.2	—	—	98.8	—	—	98.8	—	—	—	—
2	♀	15	Root fragments, subacute abscess LF	XXX	99.7	XX	S	—	—	—	X	—	—	X	—	—	—	—	—
3	♀	12	Carious abscessed roots in LF	XXX	100.3	XXX	SP	X	99.2	XX	—	99.1	—	—	—	—	—	—	—
4	♀	72	Infected clot due to loose bone fragments	XX	99.2	—	ST	—	—	—	—	—	—	—	—	—	—	—	—
5	♂	37	Infected clot due to loose bone fragments	XXX	99.8	—	ST	X	—	—	X	—	—	—	—	—	—	—	—
6	♂	38	Acute abscess at point of needle puncture in diabetic	XXX	100.6	XX	ST	X	99.5	XX	X	99.1	X	X	98.8	X	—	—	—
7	♂	34	Extensive radicular cyst of mandible	—	—	—	SP	XX	100.4	—	XX	99.4	—	X	—	—	—	—	—
8	♂	42	Acute palatal abscess due to bristle in rugae	XXXX	101.6	—	S	X	99.1	—	—	—	—	—	—	—	—	—	—
9	♀	19	Necrosis of interseptal alveolar bone	XX	99.4	X	S	XX	—	—	—	—	—	—	—	—	—	—	—
10	♀	36	Fracture of external oblique ridge and buccal plate with necrosis	XXXX	103.2	XXX	ST	X	99.4	XXX	X	99.1	XXX	X	99.2	XX	—	—	X
11	♀	28	Root tip in antrum, eight days' duration	XX	100.1	—	S	XX	99.4	—	X	99.6	—	X	99.2	—	—	—	—
12	♀	11	Lingual perforation of acute abscess RF	XX	102.3	XXX	SP	X	99.2	XX	X	99.2	XX	—	98.8	X	—	—	X
12A	♀	32	Acute abscess three days' duration RH	XXX	99.4	XXX	S	XX	99.3	XXX	X	99.4	XXX	X	99	XX	—	—	XX
13	♂	8	Lip tear, subacute abscess, extensive swelling	XX	99.7	—	S	X	99.1	X	—	—	—	—	—	—	—	—	—
			Root Resections																
14	♂	53	Radicular cyst L1	—	—	—	SP	XX	99.4	—	X	99.1	—	X	—	—	—	—	—
15	♀	35	Granuloma L1	—	—	—	ST	XX	—	—	XX	—	—	XX	—	—	—	—	—
16	♂	18	Diffuse abscess L1	—	—	—	ST	XX	99.6	—	XX	99.2	—	XX	—	—	—	—	—
17	♀	35	Diffuse abscess L1	—	—	—	S	X	99.1	—	X	98.8	—	X	—	—	—	—	—

*S, sulfanilamide; ST, sulfathiazole; SP, sulfapyridine.

TABLE 6.—CONTAMINATED OPERATIVE WOUNDS; CONTROL

Case	Sex	Age	Clinical Condition on Presentation				Postoperative Results											
							First Day			Second Day			Third Day			Eighth Day		
			Diagnosis	Pain	Temperature	Adenopathy	Pain	Temperature	Adenopathy	Pain	Temperature	Adenopathy	Pain	Temperature	Adenopathy	Pain	Temperature	Adenopathy
1	♂	25	Diffuse abscess R2	—	—	—	XX	99.8	—	XX	99.1	—	X	99.2	—	—	—	—
2	♀	15	Root fragments, subacute abscess R6	XX	99.3	—	XX	99.2	—	—	98.7	—	—	—	—	—	—	—
3	♀	12	Root fragments in RH, subacute abscess	XX	99.4	—	X	—	—	—	—	—	X	—	—	—	—	—
4	♂	25	Infected alveolar clot due to bone fragments	XX	98.8	—	XX	—	—	X	—	—	X	—	—	—	—	—
5	♂	13	Subacute infection of alveolar clot due to bone fragments	XX	99.6	X	X	98.9	—	X	—	—	—	—	—	—	—	—
6	♂	38	Acute abscess at point of needle puncture, diabetic	XXXX	102.4	XX	XX	100.3	XX	XXX	100.6	XX	XXX	100.6	XX	Compare Table 5		
7	♀	19	Medium radicular cyst of mandible	—	—	—	XX	99.1	—	X	99.2	—	X	—	—	—	—	—
9	♂	48	Necrotic interseptal bone	XX	—	—	XX	—	—	XX	—	—	XX	—	—	X	—	—
10	♂	48	Fracture of tuberosity R8, three days' duration	XXX	99.8	—	XX	99.1	—	XX	—	—	X	—	—	—	—	—
11	♂	36	Root tip in antrum, three hours' duration	X	—	—	XX	98.8	—	X	99.2	—	—	—	—	—	—	—
12	♂	32	Subacute abscess of operular flap	XX	98.8	X	X	—	X	—	—	—	—	—	—	—	—	—
12A	♀	32	Acute abscess RH, four days' duration	XXXX	102.6	XXX	XXXX	100.3	XXX	XXXX	99.4	XXX	XXX	99.5	XXX	Compare Table 5		
13	♀	37	Lip tear, subacute infection, extensive swelling	XX	99.8	—	X	99	—	X	99.1	—	—	—	—	—	—	—
			Root Resections															
14	♀	41	Granuloma R3	—	—	—	XX	98.8	—	X	—	—	X	—	—	—	—	—
15	♂	30	Granuloma R2	—	—	—	X	—	—	X	—	—	X	—	—	—	—	—
16	♂	26	Granuloma LC	—	—	—	XXX	99.2	X	XX	99	X	XX	—	—	—	—	—
17	♀	35	Diffuse abscess R1	—	—	—	XX	98.9	—	X	—	—	X	—	—	—	—	—

of the oral tissues, whether they be hard or soft, is indicated. I must again state my original premise that interference with normal granulation tissue is not a rational procedure. However, where infection is encountered and the tissue resistance is lowered by the presence of this infection, local sulfonamide therapy appears to be a valuable precedure.

I am aware of the numerous difficulties confronting the investigator who attempts to carry out controlled studies on private patients. In fact, such studies, while important, might best be characterized as "approaching controlled studies." The data obtained from them should be added to and considered in the light of findings under conditions where better control can be obtained. Unfortunately, studies of this type on the sulfonamides have not been reported in the dental literature. Such studies are needed in order to determine the exact conditions under which any one of several sulfonamides can be most useful. Also of importance are questions relating to the comparative effect on "inert" agents, which might act by absorbing tissue fluids, and the need or lack of need for sterilizing sulfonamide powders before they are applied. There are numerous other questions which will occur to the reader.

Unquestionably, successful clinical application is the ultimate goal in any therapeutic measure. Care must be taken where there is a wide choice of means of administration and dosage lest some treatment be discarded without due consideration. Conclusions either positive or negative should be avoided until the facts, made evident only by carefully controlled clinical procedure, make possible these conclusions.

SUMMARY

1. In average uncomplicated extractions, the routine use of sulfonamides is not indicated.

2. Local sulfonamide therapy may be used with some advantage in acute or subacute conditions involving the hard and soft tissues of the oral cavity.

3. With sulfonamide therapy, tight closure of the wound appears to be a desirable procedure.

4. Large masses of sulfonamide drugs in the form of cones or tablets are never indicated.

5. There was no noticeable difference in tissue reaction to the different sulfonamides.

6. In clean wounds of the hard and soft tissues, in which careful débridement and irrigation are carried out to remove all foreign elements, local therapy is of no advantage.

7. The use of chemotherapy does not permit failure in surgical technic or asepsis. Neither does it eliminate the necessity for adequate postoperative supervision.

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SUBGINGIVAL CURETTAGE

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IF you were asked by a patient, "What is your opinion of subgingival curettage for treating a pathologic pocket?" what would be your answer? And if the patient, not being satisfied with your opinion, and wishing to learn more before permitting operative measures, asks another question, "Upon what facts, evidence, actual experiences of yourself and others, do you base your reasoning?" what would you say?

Is it not true that, because of the controversial expressions on this subject, the minds of many general practitioners are divided; they believe it is right or it is not right, or they are straddling the fence, not knowing which way to jump?

Are the objections to the use of subgingival curettage founded on facts, proving that it is not a successful method of therapy?

In this discussion, an attempt is made to show that the objections to the use of subgingival curettage are not well founded; that visibility and accessibility are not always necessary; that removal of the hard deposits is not a difficult problem if properly handled; that although it may be an exacting technic, it is not "too tedious" or very painful; that granulation tissue need not be removed to the extent frequently advocated; that this method does not "take too much time" in comparison with other methods, and that it is a successful method of therapy.

The several methods that are employed in the treatment of the periodontal pocket are commonly divided into two main groups, the conservative and the

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radical. The term "surgical" is more frequently used than "radical" at the present time; but this is a misnomer since it implies that conservative therapy is non-surgical. Dunning and Davenport[1] define surgery as "the branch of medical science concerned with the treatment of diseases or injuries by means of manual operations." The definition of conservative surgery is given by them as "that which is based on conservation and repair, rather than upon removal." The conservative therapy is therefore a surgical procedure. In fact, all therapy with the exception of the medicinal and chemical can be classified as such. The term "conservative" was undoubtedly applied to this technic because one of its basic principles is the conservation of the gingival tissues and the alveolar structure.

Therapy means the treatment of disease. The general objective of any therapeutic procedure should be to restore the affected tissues to health and function. In treatment of the pathologic pocket, this has been attained clinically when there is no longer evidence of an inflammatory process and no purulent exudate, and the tissues have healed. Now the question arises: Will subgingival curettage accomplish such a result?

Clinicians who treat periodontal conditions by this method are convinced that it is successful, as attested by their observation of innumerable cases and the experience of many years. On the other hand, there are those who hold the opposite viewpoint. Let us discuss what they consider the disadvantages of this method of therapy.

One of the points that are brought out on various occasions to support their contention that subgingival curettage is not a satisfactory method is lack of visibility and accessibility, which are desirable in any procedure, but not necessarily a requirement for thorough subgingival therapy, especially when they are obtained through the loss of irreplaceable gingival tissue. The inability of the operator to see into the pocket need not be a great disadvantage. If it were, how can the excellent clinical results of so many practitioners be explained? From a practical standpoint, it is possible to differentiate among the several structures involved without actually seeing them. With training, one soon reaches a point where, by mental visualization and concentration on instrumentation, it is possible to follow the progress of the instrument. Thus, lack of vision may be overcome by the development of the tactile sense and knowledge of the tissues involved. If the general practitioner will begin by treating shallow pockets, thus developing his feel of the tissues, operating in the deeper parts of the pocket will not be so difficult.

Gaining entrance to the subgingival area presents no particular problem in the majority of cases. The average type of pocket is accessible to instruments that have been designed for the purpose. There are, however, certain types in which it is difficult to reach the entire area involved; e.g., lateral abscesses on the labial surfaces of upper anterior teeth. Where such areas are found to be inaccessible through the gingival entrance to the pocket, a small horizontal incision can be made over the edematous area to permit use of the subgingival curets. In no case should a vertical incision be extended through the gingival margin. The lips of the incision should be left in apposition. If necessary, sutures can be used. Complete accessibility to the entire area is therefore obtained through the original pocket and at the point of incision. Trifurcations and bifurcations are difficult to handle, no matter what technic is used.

Regarding the difficulty of removing the deposits in the subgingival area, statements have been made that it is almost impossible to remove all the calculus unless the root surfaces are exposed. If the clinician is persistent and thorough and uses the proper technic and suitable

instruments, removal of deposits, even though hard and firmly affixed to the cementum, can be accomplished without unusual difficulty. Removal of the deposits completely is admittedly dependent on a "sense of touch." This is not an unusual gift or something inborn, but is the result of study, application and experience. Disagreement with those who assert that this technic is too difficult to be employed successfully must be voiced. The great number of clinicians, as well as recent graduates, using this method in the treatment of periodontal cases and the satisfactory results obtained by them attest to the fact that this manual skill can be acquired.

It has been frequently stated by others that subgingival curettage is a tedious and exacting procedure. Disapproval of its use on the grounds that it is uninteresting or tiresome is not legitimate and may be attributed in some degree to the attitude of the operator. It is very likely that many have attempted this technic and, failing to obtain satisfactory results for one reason or another, have become discouraged and possibly prejudiced. Of course, removal of tissue is more spectacular. It has more action and appeal to the operator. Subgingival curettage is an exacting method. All operative procedures are, when each step is carried out correctly.

It has been said that it is a painful procedure. That this is an erroneous statement is proved by the fact that local or topical anesthesia is rarely necessary. The only occasion for a local anesthetic is the operation on hypersensitive patients or in some unusual type of pocket formation. Use of an improper technic and incorrectly shaped instruments will result in laceration and traumatization of the tissues, with hemorrhage, pain and edema. Such results are the fault of the operator and not of the method. In other words, when subgingival therapy is painful, the instrumentation may have been too rough. A combination of thoroughness and gentleness is essential for the best results.

Many writers advocate the removal of granulation tissue from the pocket, considering it unfavorable to recovery. Orban[2] states that "the granulation in and below a pyorrhea pocket consists of chronic inflammatory tissue; that is, lymphocytes, plasma cells, polyblasts, a large number of capillaries and fibroblasts." Referring to gingivectomy, he continues:

> Granulation tissue below the bottom of the pocket is not a tissue to be afraid of and should not be removed surgically. It is a tissue indicating a reaction to irritation and it will disappear if the cause is removed.

Granulation tissue, the product of a chronic inflammatory process, may be replaced during healing by healthy tissue, provided the sources of irritation are removed. The premise of many clinicians that this tissue must always be excised is not substantiated by fact. The mere presence of granulation tissue should not be considered as an argument against subgingival curettage.

It is asserted that this technic is "too time-consuming" and that one of the advantages of gingivectomy is that it is a "time-saver." The time necessary for any technic is of course dependent on several conditions and will vary according to the clinician's understanding of the particular method and the tissues, his skill and experience, the type of patient, etc. With comparable etiologic and contributing factors, such as excessive occlusal force, incorrect operative restorations and prosthetic appliances, open contact points, drifting and tilting teeth and systemic conditions, will subgingival therapy take a longer time than other surgical technics? In gingivectomy, for example, time is consumed in preparing oneself for a surgical operation, the injection of a local anesthetic, the operation, instrumentation for removal of salivary and serumal deposits, the placing of the packs; and in removing and replacing the packs, ap-

plication of medicaments to sensitive areas and cauterizing of the proliferative tissue when packs are not used. In regard to this tissue, Orban[2] says:

> This new granulating tissue is removed every day from the surface with drugs, and, in that way, opportunity is given to the inflammatory tissues to heal as in an open wound. The healing will be accomplished in from eight days to three weeks.

It may be pertinent to comment on this phase of radical therapy by asking the question, "Why excise the original tissue when the tissue of repair is so troublesome to control?" With eight treatments as the minimum, and ten minutes as the least possible time required to examine the tissues, apply the medicament and dismiss the patient, a total of one hour and twenty minutes is needed for postoperative medication of only one quadrant of the mouth. The use of a pack postoperatively does reduce part of this time. In addition to these measures, there is the preoperative medication, exploration of each pocket to be eliminated and control of bleeding. Some clinicians advise that one or two sittings, preceding the operation, should be spent in removing as much as possible of the calcareous deposits in order to reduce the inflammation of the gingival tissues. Separately, many of these measures take but a few minutes each, but, collectively, they undoubtedly require quite a little time. The accepted procedure of most clinicians, in removing tissue, is to operate on one quadrant of the mouth at a time; hence, most of these steps are repeated at least four times in each case. In the flap operation, the procedure is the same except that the detached gingival tissues are not excised and the flaps are sutured. When bone surgery is advocated, additional time would be spent in curetting the alveolus and reducing the height of the alveolar crest. Some men even hospitalize patients for the more radical surgical procedures.

In subgingival curettage, the clinician may begin treatment of the lesion without the extensive preliminary preparation required in the more radical types of therapy. As previously stated, local anesthesia is not necessary. The treatment may be divided into three main procedures: (1) removal of all food débris and calculus, beginning with what is exposed and gradually working along the root surface until the bottom of the pocket is reached; (2) preparation of the tissues; namely, the proliferated mouth epithelium and the surface of the cementum; which is highly important, since one of the requirements for healing is vital, clean, freshly exposed tissue surfaces, and (3) creation of a final blood clot, after completion of the preparation of the tissue surfaces, by causing a slight amount of bleeding. The resultant clot, which should be left undisturbed, fills the space between the walls of the pocket, keeping out food débris, but most important, as T. Sydney Smith[3] and others have emphasized, it is Nature's medium for the formation of new tissue. Since the bottom of the pocket does not always extend to the alveolar crest, the curettement of bone is not indicated. Débris and pieces of calculus in the subgingival area become mixed with blood and are removed with the clot during the therapeutic procedure. The moderate amount of bleeding that occurs will wash the wound of any purulent exudate. Flushing the pocket with a solution is unnecessary. In fact, it should not be done since it tends to disturb Nature's healing process. One of the best agents for cleansing a wound is the flow of blood from and through the wound itself.

The proliferated mouth epithelium requires no special medication, such as sodium sulfide. During instrumentation, the edge of the curet will freshen the surface of this tissue sufficiently, no other treatment seeming to be necessary. The investigations of Beube[4] confirm this clinical observation. His findings indicated "that sodium sulphid may be detrimental

in treatment, since the average decrease in pocket depth was nearly twice as great with simple curettement (in the control pockets) as it was with curettement supplemented by application of sodium sulphid."

With regard to the time required for therapy, it may be stated that: 1. In treatment of shallow pockets, the time factor is decidedly in favor of the conservative method. 2. In the case of 4 to 6 mm. pockets, the time required for thorough treatment by either method will be approximately the same. Possibly, in certain cases, subgingival curettage will take slightly longer, but it is not enough of a factor to be called even an economic disadvantage. 3. Treatment of advanced cases or of deep pockets on individual teeth by subgingival curettage may consume more time than if gingivectomy were performed. Advocates of other methods frequently extract such teeth, although these are the cases in which subgingival therapy produces splendid results. Although this method of treatment does take an hour or so longer, will not the retention of the teeth and the conservation of the tissues in a healthy condition be a definite advantage to the patient?

In contrast to the various objections voiced to subgingival curettage, emphasis should be placed on the experience of those who have used this method that conservation of the tissues has many advantages. Several may be enumerated:

1. Maintenance of function. Normally, the septal gingivae is pyramidal, filling the interproximal space, and because it slopes away from the contact point buccally and lingually, food is diverted from the embrasures. In pathologic conditions, the septum is often badly swollen. Consequently, its anatomic form is changed and the tissue is subjected to irritation from food débris. Subgingival curettage will reduce this inflammation, bringing the tissue back to normal form and thereby restoring its function. On the other hand, removing this tissue increases the area of the interproximal space, permitting accumulation of food particles and greatly increasing the difficulty of the patient in keeping the mouth clean.

2. Prevention of sensitivity of root surfaces. Subgingival curettage does not expose large areas of the root surface, and the patient is therefore not disturbed by sensitive teeth. Sudden removal of the gingival tissue subjects the root surfaces to thermal shock and the action of acids, necessitating frequent applications of eugenol packs or silver nitrate. While this sensitiveness of the exposed dentin may be controlled in most cases, in some it is always a source of annoyance. There is also the question of possible shock to the pulp. The possibility of erosion, cavity development or toothbrush abrasion is always greater when the root surface has lost its tissue protection.

3. Preservation of esthetic values. Removal of the gingival tissue does not improve the patient's appearance; in fact, it often has a disfiguring effect. This is not an important factor in the posterior areas, but in the anterior region, appearance should be considered. I recently observed the case of a woman, aged 31, who had been treated by gingivectomy in 1930. The area operated on extended from the upper first bicuspid on one side to the first bicuspid on the other side. The labial tissues were resected to a depth of 5 mm. and the alveolar bone was curetted. In the meantime, progressive or recurrent disease of the gingival tissues developed, with migration, rotation and loosening of the six upper anterior teeth. The present condition is such that extraction is necessary. The result of cutting away so much of the tissue, plus additional changes that occur because of the extractions, will be a ridge more reduced in height than it would have been had not the labial structures been removed. Therefore, in restoring these teeth, the question of esthetics becomes a more

serious and difficult problem than it was after the gingivectomy. To obviate this condition, some clinicians have adopted a modified form of therapy in which none or only a slight amount of the labial tissue is resected. It is interesting to note that the treatment of such pockets is subgingival curettage. This is somewhat inconsistent, in view of the many statements that this particular method of therapy will not stop the progress of the disease and that any pocket deeper than 2 mm. is a focus of infection and a menace to the health of the patient. If subgingival curettage is considered a practical method of treatment for upper anterior teeth, by the same reasoning it should be applicable to the lower anterior or the bicuspid teeth.

4. Conservation of bone. Histologists have shown that the bone in these cases is not necrotic and that frequently there is a layer of connective tissue between the bottom of the pocket and the crest of the alveolus. Although the alveolar crest may be injured by infection, removal is not indicated. Curettement or reduction in height of bone does not necessarily mean that the marginal level will remain at the point where the surgical operation left it. A slight additional loss will occur because the surface cellular structure has been damaged by this operation. Resorption of the traumatized cells must take place before repair can take place. The main purpose of roentgenograms in periodontal cases is to show the condition of the bone, and our chief concern is not the amount of this structure that has been resorbed, but how much is left in the interproximal areas. This is an important factor in the prognosis, since every millimeter of bone that is retained means that much more support for the teeth; and therefore, a therapeutic procedure which does not remove any of this tissue has a decided advantage over any method which will cause loss of support to an already weakened tooth.

5. Regeneration of bone. The question of bone regeneration in periodontal cases has been discussed by many clinicians, and especially by those who advocate bone surgery. The records of many practitioners contain clinical evidence of this process. Subsequent roentgenologic comparison of cases treated by subgingival therapy has shown that, in some, regeneration occurs in a vertical direction, in the vertical type of pocket formation. In cases of horizontal atrophy, restoration of the cortical layer is the most that can be expected. Illustrations of such regeneration may be found in the literature.[3, 5] This method has a definite advantage because, by conservative therapy, it is possible to obtain a greater amount of reossification or bone repair.

In discussions of this subject, the question is frequently asked, "What evidence or proof is there that subgingival curettage is a successful method of treatment?" From a practical standpoint, the histologic data on the reparative process which have been presented up to this time consist of only a few microscopic sections of treated cases. The actual healing processes are still open to investigation. Some clinicians believe that an organic attachment of the separated soft tissues to the root surface occurs; others that only a very close adaptation of the tissues is obtained. Rule[6] states that "a reunion will take place within five to seven days, and with reasonable care thereafter, it will remain permanently firm and sound." Since there is so little histologic proof, what is the basis for the opinion that this is a successful method of therapy? It is the clinical and roentgenologic evidence from many treated cases.

Since there is some question about accepting these correlated data, let us submit them to critical examination and give some consideration to the means by which they are obtained:

1. The examination of the patient. One of the first considerations is the general appearance of the gingival tissues. Then follows a careful exploration to

determine the presence of pocket formation. Roentgenograms are taken to show the structure of the bone and the location and amount of resorption. Hence, it is the clinical and roentgenologic dental and medical aspects which determine the status of the case.

2. The treatment period. The patient is dismissed after curettage, when the pathologic symptoms are no longer present and the tissues have been restored to normal health. At this time, it is clinical evidence which determines whether the tissues have responded to subgingival therapy.

3. Subsequent observation of the case. It is only through reexamination of a patient over a period of years that the true efficacy of the therapy can be established. The clinical appearance and examination of the gingival tissues will indicate whether treatment was successful. By comparing the original and subsequent depth of the pockets, one can accurately determine the degree of healing that has occurred, but most important is a second set of roentgenograms for comparison of changes in the crest of the bone. It is the correlation of both the clinical and the roentgenologic findings which determines the status of the treated case. This is the same type of evidence on which the original diagnosis was made. It is just as necessary to employ detailed clinical and roentgenologic methods of examination to determine the success of treatment as it was to use these methods for determining the original status of the case.

Many clinicians do not make this roentgenologic comparison of their treated cases, depending on the clinical condition for evidence of the results of therapy. It has been the experience of those who advocate subgingival curettage that pockets are closed and remain so indefinitely as a result of this method of therapy. Many of these treated cases have been observed for more than twenty years. They require no particular treatment other than the usual periodic prophylaxis.

SUMMARY

1. Visibility and accessibility are not essential for treatment of the pathologic pocket.

2. Removal of the subgingival deposits by curettage, although exacting, can be mastered by study and application.

3. This method is not a laborious and painful technic.

4. The surgical removal of granulation tissue *per se* is not routinely indicated.

5. Curettage does not "take too much time."

6. The possibility of conserving the gingival tissues and the alveolar bone structure overbalances the objections to curettage.

7. Clinical and roentgenologic studies of treated cases have shown that subgingival curettage is a successful and permanent therapeutic procedure.

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450 Sutter Street.

THIAMINE HYDROCHLORIDE IN THE TREATMENT OF "DRY SOCKET"

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THE condition commonly referred to as dry socket has been successfully treated by the parenteral administration of thiamine hydrochloride. For the past eighteen months, I have endeavored to determine the relative effectiveness of this therapy on all types of patients, from hospital clinics as well as from private practice. This paper, therefore, is based on the findings in thiamine therapy in 130 cases of dry socket.

Evidently, a very small increase in the actual concentration of the vitamin substance is needed in the tissues to overcome the severe pain often associated with dry socket. I have found that the attendant pain ceases permanently in 69 per cent of cases within from twenty to thirty minutes after initial injection of the drug. It is well to compare this percentage of responding cases with the percentage of cases responding to other forms of therapy heretofore used. The initial injection of 1 cc. of the drug, used in a concentration of 100 mg. per cubic centimeter, which is equivalent to 33,330 U.S.P. units, in a physiologic solution of sodium chloride, evidently normalizes the vitamin balance at the site of infection by supplying the lack and raising the thiamine concentration within that time.

The solution, for best results, should be injected into the superior outer quadrant of the gluteus maximus muscle, although the trapezius or biceps brachialis may be used. With this therapy, injections should be made intramuscularly only.

In some cases, when pain has been present for two or more days before therapy is instituted, I have found that, for equally good results, the injection is best repeated within twenty minutes. If this does not bring relief from the pain which has lasted for more than forty-eight hours, and I have found this to be the case in only five cases of the 130, I advocate the double injection treatment the following day, preceding the thiamine administration by subcutaneous injection of 1 grain of codeine sulfate. For an unexplainable reason, if the pain is first obtunded with a narcotic and the thiamine hydrochloride injections are then given at twenty minute intervals, the pain will not return.

In seven cases of the 130, the pain returned within twenty-four hours after the initial injection of the drug. In no case has the pain returned in its original severity. When it has returned and persisted, double injections at twenty minute intervals the following day and then single injections for the next six to ten days are advisable. This procedure should be supplemented with oral administration of thiamine hydrochloride, 5 mg. daily for three days and 3 mg. daily thereafter for the duration of the parenteral treatment.

It has become a practice with me in hospital work as well as in private practice to give thiamine hydrochloride prophylactically to patients with visibly lowered resistance or with devitalized teeth, for from three to five days preoperatively. Five milligrams should be given orally each day before surgical procedure is undertaken and 100 mg.

(1 cc. of 33,330 units) should be injected an hour or more before the operation. In utilizing the latter prophylactic treatment prior to surgical procedure in thirty-eight cases of broken-down and devitalized teeth, not one case of dry socket has developed.

It is my impression that this method of chemotherapy is a decided advance in the treatment of the pain of osteitis. It replaces the topical treatment consisting of placing sedative packings in the wound, which is just about equivalent to treating a fever with phenacetin. The fever is diminished only during the drug action. So too with local packings. The temporary relief, which is hardly ever more than partial, lasts only as long as the medicament remains active. Thiamine therapy, I repeat, affords complete elimination of pain in a great majority of cases, and gives decided relief in every case.

450 Sutter Street.

RADIATION EFFECTS ON STRUCTURES OF THE ORAL CAVITY: A REVIEW*

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THE purpose of this paper is to compile information on radiation effects on structures of the oral cavity so that the dentist may treat cases of preirradiation and postirradiation more intelligently.

The following conditions relating to the oral cavity have been reported after exposure to radioactivity.

1. Hypersensitivity of teeth to heat, cold and touch.
2. Painful stomatitis.
3. Hemorrhage.
(a) From radium eroded vessels.
(b) From decrease in blood platelets.
4. Ulceration of mucous membrane.
5. Osteomyelitis and necrosis.
6. Demineralization of teeth.
7. Spontaneous death of pulps.
8. Cystic degeneration.
9. Loosening of remaining teeth.
10. Telangiectasis.
11. Anemia.

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THREE PHASES OF PROBLEM

Rather than to discuss each of the above-mentioned conditions separately, the problem will be divided into three phases:

1. Irritating effect of radium acting as a heavy metal poison.

2. Reaction primarily concerned with the effect on blood vessels.

3. Effect upon the calcific structure of the teeth.

1. *Radium Poisoning.*—The most publicized cases of radium poisoning were those which appeared among women engaged in painting numbers on watch dials with luminous paint. The paint used contained radium salts. Many of the women died, supposedly of various diseases. The death certificates were signed by the family physicians, the following conditions being given as the cause of death: ulcerative stomatitis; syphilis; primary anemia; Vincent's angina; phosphorous poisoning, and osteomyelitis of the jaws. At least fifty of these women were under treatment

by various dentists for jaw necrosis.[1] It remained for Theodor Blum[2] to suggest that there might be a connection between the type of work these women were doing and the osteomyelitis of their jaws. An investigation was undertaken and the true cause was discovered. It was found that these employes used a small brush to paint the dials and that they wet the brush with their lips in order to bring it to a fine point. Thus, over a period of time, considerable radium was ingested. Much of this radium passed through the alimentary canal, but some entered the blood stream and finally lodged in the marrow of all the bones.

Persons who suffer radium poisoning are not those who are under radium therapy, with the exception of those who may be receiving intravenous injections of radium salts, but the workers who are handling or who are near radium for a considerable time.

In radium poisoning, the radium in the bone marrow and blood stream emits irritant rays which constantly bombard the blood-forming centers. Martland[1] says:

> If leukoblastic centers are affected, then sepsis and bone necrosis are apt to supervene. If the megakaryocyte is destroyed, the diminution in blood platelets causes a hemorrhagic diathesis to predominate and hemorrhages from the mucous membranes occur. If the main injury is to the erythroblastic centers, the symptoms of a profound anemia of the aplastic type sometimes result. Combinations of all these conditions occur.

At necropsy, cases of radium poisoning show that the bone marrow is replaced by a gelatinous, myxomatous, acellular, loose fibroblastic tissue.

It should be understood that, in radium poisoning, the entire body is affected, but the oral cavity is usually the first place that any manifestations are evident. The most frequent subjective symptoms are necrosis of the jaw and ulceration of the mucous membrane. The most frequent objective symptom is leukopenia.

The jaws are more oten affected than other bones because they are more apt to be subjected to trauma. It is also true that the mouth is among the most unclean parts of the body, and the presence of teeth in bone affords an easy avenue for infection. The slightest dental intervention may start a necrosis. There is little resistance to infection owing to inadequate nutrition from anemia, and a lack of defensive forces from reduction of polymorphonuclear cells.

In radium poisoning, it is the alpha ray that does the damage. This ray is very deadly, but less penetrating than the beta or gamma rays.[3] It has been estimated that it is 10,000 times more destructive to human tissues than the gamma ray.[1] The gamma ray is the one usually used in radium therapy, the alpha and beta ray being filtered out.

In radium therapy, the action of the rays is limited as to time. In radium poisoning, there is in the body an accidental deposition of radium, which, if in a pure state, will remain active for 1,750 years. So far, there has been no method discovered whereby the radium can be changed into some form of soluble salts and thus be eliminated.

2. *Reaction Primarily Concerned with the Effect on Blood Vessels.*—The effect of irradiation on the teeth, mucous membrane and jaw varies with the type of radiation employed, the dosage and the extent of the disease and according to whether infection is present. The employment of x-rays properly filtered, and applied in moderate divided doses through the cheek and jaw from the outside, does not affect the teeth as much as intra-oral x-ray therapy or direct radium contact. The use of interstitial radium therapy in the mouth close to the bone usually causes necrosis.[4]

There are two distinct methods for complete sterilization of a tumor by irradiation, selective irradiation and caus-

tic irradiation.[5, 6] The first destroys the cancer cells without serious damage to the normal surrounding structures. It is used when the surrounding normal cells are less radiosensitive than the cancer cells. The other method involves the application to highly radioresistant tumors of doses sufficient to cause their destruction, with serious injury to surrounding tissue.[5] One of the accepted theories regarding the results obtained with the roentgen rays is that they are due to the obliteration of the blood vessels, with consequent malnutrition of the new growth. It can therefore be seen that, when caustic irradiation is employed, all normal tissue over a considerable area will have a diminished blood supply.[7] The cumulative effect of radiation on normal tissue is retrograde changes, and obliterating enarteritis,[8] making these tissues susceptible to infection and radium necrosis.

Bone is more affected than soft tissue owing to the bone structure. Bone is nourished by its periosteum and nutrient arteries.[9] Bone tissue has a high percentage of calcium, with a resulting secondary radiation of unusual degree. Heavy doses of x-rays or radium may cause the bone to become hard and brittle, and fractures may easily occur.[10]

The periosteum is highly susceptible to irradiation. Gross swelling and thickening occurs and the periosteum strips easily from the bone. The inner surface of the periosteum presents a thick hyaline layer without cells. The layer of osteoblasts usually found on the inner surface of the periosteum in contact with the bone may be absent. This probably explains the lack of bone regeneration after sequestrectomy. The arterioles may be strangulated by a postirradiation swelling of all the coats comprising the walls of these vessels. The bone itself shows osteoporosis. The bony structure is less substantial, and extensive obliterative sclerosis of the nutrient vessels takes place. The canaliculi are closed and capillary circulation is imperfect.

The defensive forces in such an anemic tissue are so weak that little if any resistance can be offered against infection.

Most radiologists agree that it is always best to have all dental work done, infection eliminated and the mouth put in a hygienic condition before x-ray or radium therapy.[7] The radiosensitivity of intra-oral cancer is diminished by infection.[11] Therefore, in the presence of infection, a larger dose is necessary to destroy cancer cells, with subsequent destructive effect on the normal tissue.[7] If infection remains in the mouth, on irradiation the barrier of inflammatory tissue surrounding this infected area will be broken down, and the infecting organism may enter the circulation and cause death by bacteriemia. Also, the pathogenic organisms present after therapy may find their way into the devitalized tissue, which is a good medium for propagation.

Salman[12] and Kaufman suggest the removal of all non-vital and infected teeth, and also those teeth which might become infected within the next three years. Others advocate removing all teeth.[10]

Teeth should be extracted before irradiation; otherwise they present a continuous peril to a patient cured of cancer, for in later years, upon extraction, they may permit introduction of infection into the devitalized mandible or maxilla.

Kaplan[4] says:

One of the actions of irradiation is to sclerose tissue. In this process, the blood vessels are shut off and nutrition is restricted in the area to which the irradiation has been directed. Therefore, subsequent trauma may activate a latent necrotic process. Where marked destruction of the superficial tissues takes place, in order to control the malignant condition, subsequent extraction may lead to osteomyelitis and further necrosis.

There are three definite etiologic factors in osteoradionecrosis: (1) irradiation, (2) trauma and (3) the ensuing infection. The trauma may be mechan-

ical or chemical.[12] There are cases on record where a mere scratch, such as could be caused by a prophylactic instrument, inflicted on sensitive irradiated tissue has caused severe tissue necrosis.[10] Application of iodine or other drugs[13] to the gum in the area of irradiation may cause deep ulceration, infection and fatal osteoradionecrosis.

In x-ray therapy, patients often note a hypersensitivity of the teeth to heat, cold and touch.[14] The peridental membranes swell and the teeth feel elongated. There is also a severe stomatitis. Thus, it is painful and difficult to keep the mouth clean. In many instances, the sockets shrink[4] and the teeth become loose. Thus, in an unclean mouth, the stage is set for pathogenic organisms to find their way between the loosened teeth and the gum margin down to the bone, which has a lowered resistance, and to set up an acute suppuration.

WATSON'S TABLE SHOWING NECROSIS PERCENTAGE IN VARIOUS AREAS

Site	Cases	Necrosis	Per Cent
Alveolar ridge	121	48	40
Floor of the mouth	180	62	34
Buccal mucosa	149	37	25
Tongue	541	55	12
Tonsil	206	11	5
Lip	622	22	3.5
Total	1,819	235	12.9

A devitalized section of the mandible may be symptomless for years after a course of irradiation, and then a severe osteomyelitis may suddenly be produced by the uncomplicated extraction of a tooth which permits the introduction of infection into the bone.[10]

Kaufman[12] reports a case of carcinoma of the mouth, treated by x-rays with no recurrence after several years. The patient had complained of toothache. An x-ray film showed a cyst present. The dentist extracted the tooth and removed the cyst without taking the history. Necrosis of the entire mandible resulted, and the patient died.

One should be very careful in doing any dental work for any one who has received irradiation about the head or neck. There should be no surgical interference if it is avoidable. Conditions should be treated symptomatically.[12] Loose teeth should be allowed to exfoliate to the point where they can be picked out. Careful root-canal work is preferable to extraction.[17] The oral cavity should be kept scrupulously clean. Any medicaments necessary should be very mild. If prosthetic appliances are constructed, extreme care should be taken that they do not irritate sensitive irradiated tissue.

Osteoradionecrosis is of rather common occurrence. According to Watson,[10] the incidence seems to be proportional to the closeness of bone to the area irradiated. Watson's table seems to verify that fact.

Watson further states that these figures are undoubtedly low, as only three years have elapsed since the treatment of many of these patients. He believes that many more will develop necrosis. It is also very likely that a number of patients who died of cancer might have experienced bone infection if they had lived. He does not state, but it would be of value to know, how many patients were edentulous, and how many developed an osteomyelitis due to the condition of the teeth present.

In the treatment of epulis by radium, Withers[15] states that, in his experience, irradiation of peridental structures results in the loss of irradiated teeth within eight to eighteen months."

Hazen[16] reports ten cases in which women had x-ray therapy applied to the upper lip and face for removal of superfluous hair, with detrimental effects to the oral structures. Seven showed atrophy of the alveolar bone with accompanying retraction of the gum varying from one-eighth inch to the entire length of the

root. Nine had telangiectasis[6] of the face and mucous membrane. Instead of small dilated capillaries, most of these cases showed deep purple areas of venous engorgement which ranged from one-sixteenth to one-third inch. Five gave a history of deep boring pain in the jaws. Hazen asserts that one case showed atrophy of the dentin. He states that the teeth near the irradiated area became reduced in diameter and shorter. This seems questionable. Probably the enamel crumbled away, the teeth appearing to have shrunk.

These cases are mentioned because it seems that women vain enough to undergo this treatment would be sensitive about volunteering information to dentists to whom they go for subsequent care. A dentist, not knowing or suspecting the history of these cases, might easily instigate treatment for periodontoclasia or attempt wholesale extraction. Either treatment probably would result in osteomyelitis, which might prove fatal.

The treatment of osteoradionecrosis should be very conservative. Sequestra should be very gently removed, and nothing should be done to stir up infection. If the condition is finally arrested, regeneration of bony tissue rarely takes place, because of the decrease in blood supply and absence of osteoblasts. Cluzet[17] reports non-union or marked delay in healing of fractures after only moderate irradiation.

Hemorrhage[13] often takes place from radium-eroded vessels, especially in treatment of lesions of the tongue.

Spontaneous death of the pulp is common after irradiation. Leist[18] says:

> The death of these pulps is usually not accompanied by a pulpitis, but is a non-inflammatory disintegration of the pulp. The necrotic pulp may become infected later, probably by way of the blood stream.

In experimental irradiation of dog's teeth,[18] it is shown that there is destruction of the odontoblasts, reticular atrophy of the pulp and cystic degeneration of the roots without any lesions of the enamel. Ranzi[19] and Salis believe that there is a more pronounced effect on the mesodermal tissue of the oral cavity than on epithelial tissue.

It seems that the death of pulps after irradiation can be explained not only by their diminished nutrition, but also by the fact that the vessels within them, on postirradiation swelling, would have no room for expansion, and are crushed against the confining walls of the pulp chamber.

3. *Effect on the Calcific Structure of the Teeth.*—After irradiation, crumbling[10] of the enamel may take place. These lesions may not occur until four to eight years after treatment. They develop slowly and are usually painless. The lesion seen is a result of decay or erosion of the enamel usually starting at the neck of the tooth. It is superficial at first, but extensive. The condition progresses toward complete amputation of the tooth at the neck. There seems to be a general demineralization of the teeth and a rapid wearing away of the incisal and occlusal surfaces.

If this condition is present, the dentist should suspect previous irradiation. Extraction should not be attempted. Root-canal work is the procedure of choice, because it can be done aseptically; whereas it is impossible to extract a tooth and prevent pathogenic organisms from getting into the alveolus.

Del Regato[14] observes that these lesions often occur without direct irradiation of the teeth. They may result from irradiation of the neck or face, and may appear in both the maxillae and the mandible.

Rouyier,[14] at the Foundation Curie in Paris, noted that in roentgen-ray therapy applied to the face and neck, the saliva quickly becomes acid. He believes that this is due to some alteration in the salivary glands. It may be that this acidity of the saliva is the cause of the erosive lesions of the teeth.

CONCLUSIONS

1. A complete history is necessary for intelligent dental treatment. After irradiation of the head or neck, it is advisable to communicate with the practitioner who administered the treatment, to learn the dosage given, the area treated, the protection given during irradiation and the date of treatment.

2. If a patient working with radioactive substances comes in for treatment, the dentist should insist on a complete blood examination before proceeding.

3. All infection should be eliminated from the oral cavity before x-ray or radium therapy.

4. Before extensive treatment, all remaining teeth should be extracted.

5. In case of previous irradiation, the case should be treated symptomatically. There should be no surgical interference if it can be avoided. The operator should be careful to avoid trauma even in prophylaxis, operative work and prosthesis.

6. The mouth must be kept in a hygienic condition after therapy.

7. Care should be exercised in x-ray diagnosis, owing to the change in structure of the bone.

8. Radical dental treatment is indicated before irradiation. Afterwards, extremely conservative treatment is imperative.

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NOTE: The opinions or assertions contained in this article are the private opinions or assertions of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval service at large.—Article 113, U. S. Navy Regulations.

REVIEW OF POSTERIOR TOOTH FORMS

By F. W. Hinds, D.D.S., Dallas, Texas

IT is evident that from the time of the first attempt to replace natural dentures with artificial ones, man has continually tried to carve tooth forms that would simulate or imitate natural teeth. Within the past two decades, many operators, men who have been serious students in the field of prosthetic dentistry, have become interested in mechanical occlusal forms. For this reason, it seems that a review of posterior tooth forms would be a timely subject.

Let us first study the anatomy of natural teeth in an attempt to understand the reasons for their particular structure. We must all admit that Nature constructed an efficient machine in the natural denture, even if she did fail to provide the means for its maintenance.

In the human dentition, we find the bicuspid with two cusps admirably suited for grasping and holding, while the molars, with their details of occlusal form, are designed for crushing and grinding food.

Occlusion[1] is known as the contact of the teeth of both jaws when closed or during excursive movements of the mandible.

During the movements of occlusion, the upper anterior teeth slide over the lower in a cutting, scissor-like movement. After incision, the food is carried back to the posterior teeth, where a mortar-and-pestle-like movement is carried on. In the mesiodistal direction, the coronal sections of the teeth are broader through the occlusal or incisal third than at the necks. This bell-shape of the tooth crowns causes their proximal surfaces to touch at a point representing the greatest mesiodistal diameter, which is usually near the occlusal surface or cutting edge. Between this point of contact and the cervical line, there exists a V-shaped area called the interproximal space. The interproximal spaces are necessary for that freedom required to maintain healthy gingival tissues. The point where the proximal surfaces touch is the so-called contact point. In perfectly formed teeth, this contact is marble-like. (A flat surface contact would be disastrous.) The contact point in posterior teeth is usually in the buccoclusal third of the proximal surface.

Because the proximal surfaces of the teeth are convex, from the contact point are spaces widening toward the buccal and the lingual aspects. These spaces form embrasures, the lingual embrasures, of course, being the largest.

A study of the anatomic details of the occlusal surfaces discloses the cusps, marginal ridges, fossae, grooves and oblique and transverse ridges, a perfectly formed appliance for a definite purpose. With the exception of the anterior teeth, where we have concave lingual surfaces, all surfaces are convex as is necessary to maintain cleanliness and the health of the surrounding tissues.

This, of course, is a description of the posterior teeth in an ideal natural denture in a young person.

Since it is agreed that in form the natural teeth are efficient, why should there be an urgent demand from at least many members of the dental profession

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for types of posterior teeth that would be obviously less efficient if in the natural dentures? I believe the answer is cuspal interference.

It is perhaps possible, on an adaptable articulator, by means of correct registration, to orient the teeth to such a degree that one can get perfect balanced occlusion. And what is balanced occlusion? Let me quote from Washburn:

Balanced occlusion means that in either lateral, protrusive or intrusive movements of the mandible, we would have continuous sliding, grinding contact of the occlusal surfaces and interdigitation of the cusps of the teeth, with the condyles in their paths acting as balancing devices for their movements.

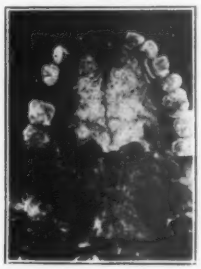

Fig. 1.—Occlusal view of maxilla teeth from an old skull, perhaps several thousand years old.

Fig. 2.—Occlusal view of teeth in mandible from skull; showing resemblance to original Hall teeth. (Compare Figs. 1, 3 and 4.)

Yes, no doubt this can be done. We perhaps can get balanced occlusion. I am sure that the dental profession watches our efforts with approval and applauds our success. But let me ask, first, have we been able to teach the greater number of dental operators to set up teeth in balanced occlusion? If the answer is no, let us not say that they are ignorant and inefficient: they are not. Whenever a simple method that will give worth while results to the average operator has been presented, it has immediately been accepted by the great majority of the dental profession. When I use the word "simple," I do not mean a method requiring less labor, but one with less probability of error.

Fig. 3.—Lateral view of mandible, showing thickness, and shape and form of ramus. (Compare Figs. 1, 2 and 4.)

Fig. 4.—Lateral view of maxilla and mandible, showing curve of occlusal path. (Compare Figs. 1-3.)

In the meantime, may the work with adaptable articulators proceed. There is another question that should be asked: If a denture is in balance when it is delivered, will it necessarily be in balance one month, six months or one year later?

From the time of the first artificial dentures, dentists have recognized that the bite closes, but they did nothing

about it; and a great many of us are still doing nothing about it; but that is another subject.

Most authorities state that the body is completely changed every five to seven years. Even if we cannot say just how such a change takes place, we do know that the tissue under dentures is constantly changing and the natural deduction is that, since this is true, surely a perfect balance cannot be maintained with porcelain teeth unless changes are made by grinding the occlusal surfaces.

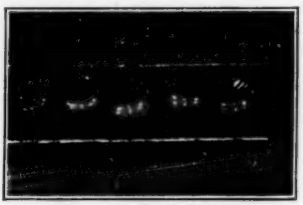

Fig. 5.—Early Ash teeth.

Fig. 6.—Occlusal path chewed in by patient recorded in stone.

I believe these two facts have prompted members of the profession to introduce the new lower cusp and cuspless tooth forms. In fact, a very good case can be presented for the new forms, but that is not all of the story.

Let us compare the natural dentition with artificial dentures. It would not be news to the profession to read that artificial denture construction presents a far greater problem than the reconstruction of natural dentures.

In the natural denture, granted that the surrounding tissues are healthy, we have stability. Even though, as we know, interfering cusps will destroy teeth, there is stability until the teeth are completely lost. An interfering cusp in an artificial denture will cause immediate discomfort.

The question as to why patients apparently succeed in using dentures that do not have even the semblance of a balance is often asked.

The answer, I believe, is that they

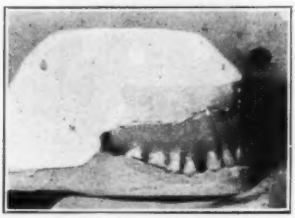

Fig. 7.—Lateral view of upper denture; teeth ground to chewed-in path.

Fig. 8.—Central bearing screw in upper denture to control vertical dimension.

learn to use only a limited range and sometimes do not grind at all, but use only a chopping bite. They are tolerant enough to put up with inefficiency. Conversely, many patients become more exacting as the operators approach a perfect or a functional balance, and if a cusp is over length the thickness of a sheet of tissue paper, they are irritated even though they have better function.

In natural dentures, as we know, the

teeth are in constant eruption. The cusps of the teeth wear to compensate for the eruption and for occlusal changes. (Figs. 1-4.) In artificial teeth, there are no such changes in the occlusion, and, with a consequent pressure, changes occur in the supporting tissues.

The wearing down of the occlusal surfaces of natural teeth no doubt prolongs the life of the tooth, but lowers its efficiency.

Fig. 9.—Recorded paths on lower bite-blocks with Gysi arch formed by central bearing screw on brass plate with 20 degree lift.

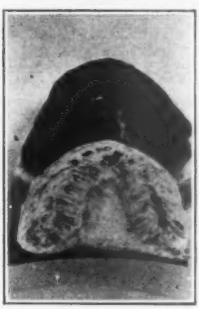

Fig. 10.—Stone path recorded from wax "chew-in."

In the past, many sets of artificial teeth had the surfaces ground flat, because the patient had complained of irritation on masticating. The dentist ground the cusps away, eliminating the irritation, but lowering the efficiency, so they could not chew so well.

Students of prosthetics have attempted to improve every phase of denture construction. We have an era when they feel that the impression is the thing. When changes in the impression do not solve the problem, we are prone to return to a consideration of the problem of occlusion. The many different types of instruments on the market and the different schools of thought prove that we have not solved the problem of orientation of the teeth. Success has not followed our efforts. For the past fifteen to twenty years, we have found that more

Fig. 11.—Recorded occlusal path in stone.

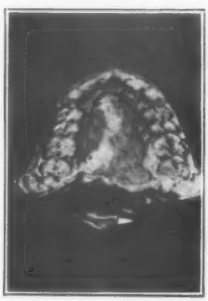

Fig. 12.—Stone path showing different types of cusps.

and more students and, what is more prophetic, more and more dentists, are adopting low-cusp or cuspless teeth. This, at least, reduces the number of interfering cusps.

It is indeed a far cry from the deep cusp teeth of the early 1920's, first advocated by Rupert E. Hall about 1917, to the Hall cuspless teeth of today. Cusp-

less teeth are not new. When I began practice in 1915, I saw many cuspless posterior teeth. They did not come that way from the manufacturer. The dentist ground the cusps flat to satisfy complaining patients. Sometimes, the teeth were even crisscrossed with ditches for greater efficiency.

We do not know when the manufacture of low cusp teeth began. We do know that when teeth were first manufactured, nearly all had low cusps, yet there was an attempt to follow anatomic

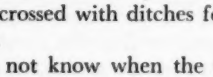

Fig. 13.—Case reported by Benson. (D. Cosmos.)

Fig. 14.—Curve ground in by use.

forms. I have attempted to collect some facts about early mechanical forms.

I am sure that there are many of early vintage, but it is rather difficult to trace them in a period of a few months. I should like to hear from any one who has definite information regarding the early manufacture of mechanical tooth forms for posterior teeth.

In a personal communication, Dr. Simon Myerson[2] describes a set of teeth sent to him by the Baker Company in 1930. They were on a partial denture and were sold to the Baker Company for gold. The denture was constructed more than seventy years ago. Dr. Myerson states that the occlusal surfaces of the molars and bicuspids are almost identical to those of the Hall teeth.

He also sent me some Ash mechanical teeth with milled surfaces that are quite old, but not so old as the teeth sent in by the Baker Company.

The actual date of the presentation of different types, although interesting, is of little importance. Dr. Swenson[2] says, "In 1927 Victor H. Sears invented the Sears trivit and Sears channel posteriors, first radical departure from the conventional interlocking tooth."

The fact is that a great many low-cusp or cuspless teeth have been introduced in the past fifteen years:

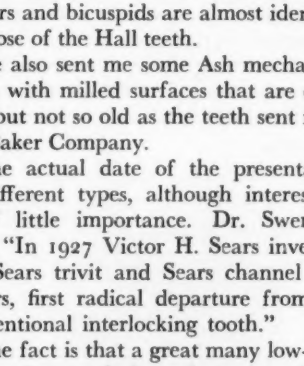

Fig. 15.—Path ground in in lower denture. (Compare Fig. 14.)

Sears' Trivit teeth, Universal Dental Co.

Sears' channel teeth, Universal Dental Co.

Sears' platform teeth, Universal Dental Co.

French veri-chrome posterior teeth, Universal Dental Co.

Hall's cuspless teeth, Coe Laboratories, Inc.

Swenson non-lock teeth, Austenal Laboratories, Inc.

Myerson true cusp teeth, Ideal Tooth Inc.

Twenty degree posterior teeth, Dentists' Supply Co.

LaDue-Saffir teeth, Justi & Sons, Inc.

Teliform vita teeth, German make.

Dr. Fish nutex teeth, Dental Mfg., London.

Ash tooth, Ash Co. (Fig. 5)

There are many others, many of them

not manufactured at the present time, although their sponsors are enthusiastic about their qualities. I presume that it will be as difficult for us to agree on a definite type as it has been difficult for us to agree on a definite articulator. I am certain that this review will not be the last word.

Before I describe any of the types on the market, let us consider the road that they will travel. I refer to the occlusal path.

The occlusal path is the important factor in reconstruction work, whether it involves the construction of an inlay, a bridge or a full denture. Earlier in this paper, I gave Washburn's definition of balanced occlusion. Since it is evident that only a few operators achieve balanced occlusion, the great majority must endeavor to attain the highest degree of functional balance possible. To do that, we must build to the functional path as established by the opposing occlusal surfaces.

What is the occlusal path? The functional occlusal path is established by the high cusps of the opposing teeth in the various and continuous movements of the mandible. One or all of the cusps may be involved in this operation. The prosthesis built to this path is, however, in continuous functional occlusion with some segment of the opposing teeth until the mandible moves out of the so established occlusal range.

In 1932, one of the students at Baylor University who has an edentulous upper jaw, the majority of the teeth remaining in the lower arch, allowed me to construct an upper denture for him, with the teeth set up to function with the occlusal path chewed into a compound bite-block in the trial plate. Wax on compound was tried at first, but this was not satisfactory, since wax on compound has a tendency to shave and curl after it has been repeatedly chewed upon, and thus, of course, the accuracy of the registered path was destroyed. We later found that wax made the best bite-block for the "chewing-in." (Figs. 6 and 7.)

It is obvious that we were not dealing with high cusps or low cusps, but with the occlusal surfaces presented by the lower teeth. Since 1933, I have used a chewing-in technic to a great extent because it affords valuable information regarding the occlusal path. The upper denture is constructed first, for appearance's sake. Then a lower bite-block is constructed. A central bearing screw is used to establish vertical dimension. (Fig. 8.)

Black wax is added to the occlusal surface of the bite-block, and the patient chews the functional occlusal path into the wax on the bite-block. If the brass plate is covered with a thin layer of wax, the central bearing screw will determine the coverage of the gothic arch, also centric relation. (Fig. 9.) We found that, if we used anatomic tooth forms, it was necessary to solder a piece of brass to the central bearing plate with a 20-degree lift or we would not have any cusps on the lower teeth when we ground them to the occlusal path poured in stone. (Fig. 10.) We also found that the more nearly complete the registration made by the patient in the gothic arch, the flatter the cusps ground in the lower teeth. (Figs. 11 and 12.)

The soldered piece of brass on the bearing plate takes the place of the incisal guidance plane. I shall, however, refer to it as the guidance plane. When flat cusp teeth are used, no guidance plane can be used. With teeth like Swenson's non-lock or trubyte 20-degree posterior teeth, a low degree guidance plane must be used. The guidance plane must always be of lesser inclination than the cusp of the posterior teeth.

The more we study the functional path, the more we realize the difficulty of orientation or setting up of teeth to a perfect balance. We must continue to bear in mind service to the many rather than perfection for the few. We must

consider the best service by the average operator in regarding tooth forms.

Nature normally grinds the cusps of the teeth to produce a functional occlusion. When, for some reason, they fail to wear down properly, disaster results. The surrounding tissue breaks down and often the teeth are lost. In 1921, Oscar S. Benson, of Baltimore, reported the case of a hermit who constructed his own dentures. The man was a graduate chemist and had some knowledge of dental procedure. Dr. Benson writes:

> This complete denture, with teeth and plate made in one piece, probably of Babbitt's metal or of something similar, was made about the middle of the year 1910, and was in constant use until the year of 1920, when the hermit died. They show well marks of use and wear. The weight of lower plate is 34 dwt. 4 gr. and that of the upper 66 dwt. 18 gr.[3]

Reproductions of the pictures of the dentures taken from the pages of the *Dental Cosmos* are shown in Figures 13, 14 and 15. The occlusal surfaces of the dentures were worn to a functional occlusal path that evidently functioned to the satisfaction of the wearer. There was only a flat surface, with no cusps at all.

Anatomic forms, as typified by trubyte posterior teeth, no doubt offer the most efficient type. The problem, of course, is one of balance and stability and becomes one of varying degrees, depending on tolerance and physical properties, ridge, muscles of mastication, etc., presented by the patient. In a letter, George Wood Clapp says:

> The key point of the masticating system in human beings is the lower first molar. This forms the center of what the writer of this letter has called the "food table" and makes a wide, firm and beautifully engineered table or anvil on which the food can be held almost inescapably while it is subjected to the pounding of the hammers of the upper teeth. This is much more important than it appears at first glance because, as age advances, the efficiency of the digestive juices wanes, so that in people 65 years of age the ptyalin has frequently lost more than 90 per cent of its digestive value. Since starches and sugars which are not well ptyalized remain as undigested elements until they meet the pancreatic secretions, mastication becomes, if anything, more vital in old age than it was in middle age.

May I state that we are confronted with limitations in both patients and dentists, and I believe that is one of the reasons for low cusp teeth.

I believe that the skill and intelligence of the average dentist is as high as those of the members of any other profession. Since entering the dental profession, I have wondered how patients are able to use dentures made even by the most skilled operators; and we are dealing with the average dentist and the average operator. It seems to me that high cusps mean efficiency where balance and stability are possible, but they increase the difficulty of maintaining stability.

Sears probably had this in mind when he carved his channel teeth. If the path is established by his lower posterior teeth, a perfect path laterally can be assured, yet the straight line or ridge in the lower teeth will make protrusive balance difficult.

The Hall cuspless teeth have a slight depression buccolingually, giving a semblance of a cusp, which makes it easier to balance in protrusive position. Yet the two continuous mesiodistal ridges, while no doubt adding to efficiency, make lateral balance more difficult, but give a functional balance. Of course, the ideal type to balance to a path would be a single cusp tooth, but here grinding efficiency would be lost completely. So it becomes a battle between efficiency and convenience. LaDue's teeth are evidently carved with the intention of presenting a semblance of a cusp and, with a pusher in the center, to force the food out of the low places.

French's veri-chrome posterior teeth appear to be modified channel teeth with

a semblance of a table, although a sloping one. By grinding the central ridge to the form of cusps, excellent balance can be obtained.

The Swenson posterior teeth embody the good qualities of many of the other types, shearing surfaces following the curvature of the average functional path, low cusps comparable to those of 20-degree trubytes, the inverted cusps of the Hall teeth and the continuous ridges following low cusp formation being, in my mind, essential to setting up the teeth in functional balance. The 20-degree trubyte is of course a modification of the regular trubyte anatomic form, presenting a faster, easier way to balance than the regular anatomic form.

It has been my experience that every type of denture case presents an individual problem, and it is a difficult matter for that reason to agree on definite types or standards. I have used mostly anatomic forms. In nearly every case, I have found it necessary to do some grinding in order to obtain a functional balance. I have used 20-degree posterior teeth, Hall cuspless teeth and Swenson non-lock teeth. In my experience, the Swenson non-lock teeth can be balanced with less grinding. Perhaps I used them in cases that presented fewer difficulties. I regret that I have not had the time to experiment with all of the different types.

I have not attempted to mention all types of low cusp or cuspless teeth. Neither have I discussed all of the types mentioned. If I seem to like a particular type, it is perhaps because I have spent more time with it.

CONCLUSIONS

1. The nearer we approach natural tooth forms and the more nearly we simulate nature, the more efficient type we have for masticating purposes.

2. The ideal types in natural dentures are found only in the young. As soon as they are erupted, teeth begin to wear, to compensate apparently for lack of balance. And Nature, as she built efficient tooth forms to be used at the height of physical activity, when most nourishment is needed, now in a methodical and intelligent manner begins to wear down the cusps and grind the path to a functional balance, apparently to save and protect the surrounding tissues.

3. Low-cusp or cuspless teeth, while seemingly not so efficient, avoid interference and protect ridges in older patients, who do not need the efficiency and nourishment that younger persons need, since, otherwise, they become overweight at 40 and fat at 50, and the heart becomes overworked. With due regard to Dr. Clapp's statement, perhaps Nature is giving us a hint.

4. We should follow Nature: anatomic teeth for the young, the rugged and those who have good ridges and are physically active, but modified or cuspless forms for those grown older. We may be glad that most denture patients are older people. And may the science of dentistry advance so that the average will be older and older! Our mission is primarily to save the teeth and the surrounding tissues.

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THERAPEUTIC RESEARCH AND THE WORK OF THE COUNCIL ON DENTAL THERAPEUTICS

By HAROLD L. HANSEN,* Ph.D., Chicago, Ill.

THE place of science in the social order has been the subject of a number of recent reports in the scientific literature. Undoubtedly, these reports were prompted by the world-wide feeling of anxiety and distress occasioned by the present disruption of our social and economic life.

In one report of this nature, Carlson[1] pointed out that the possession and the use of mechanical devices do not constitute general scientific advancement or achievement. Rather, the question whether this is a scientific age should be determined on the basis of the extent to which the methods of science are employed in attacking the problems that confront us. With this criterion in mind, it is not surprising that Carlson finds that *post hoc* reasoning is the type usually employed in problems of great importance and that present-day man is not much more of a scientist than was *Pithecanthropus erectus*.

In another report, A. V. Hill[2] suggested that scientists might be allowed to take a place of equal responsibility with politicians and others in determining what courses to pursue in matters affecting the population at large. He made the further suggestion that scientists be considered somewhat more than individuals paid to provide magic on the orders of the politicians.

To be of maximum usefulness to society, the scientist must lead the way by showing proficiency in the solution of problems coming directly within his scope. This is particularly important in matters relating to prevention, mitigation or cure of diseases.

Proficiency in work of this kind requires more than mere technical skill. It involves, among other things, the ability to take the broad view of a problem, to study it in relation to existing knowledge, to develop methods of approach which, together with the results obtained through the application of these methods, may be subjected to critical appraisal. While the fulfilment of these requirements is particularly difficult in research involving human beings, nowhere is it more necessary than in those experiments involving the human equation in both the investigator and the experimental subject.

A great many things may be involved in the expression "the broad view of the problem." Certainly one of the most important of these is idealism. In the past, two equally erroneous and equally pernicious notions in respect to research have gained wide popularity and have even been accepted by some research workers. In the first place, it has been assumed that a man who has received scientific training is, by virtue of that fact, immune to the prejudices which are so potent in governing the actions of others. It must never be forgotten that

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scientists are human beings, and should, in a mutually helpful fashion, watch themselves and each other. The second notion that has gained acceptance in many quarters is that the scientist's responsibility to members of the profession and to the public is strictly limited, that his responsibility to society does not extend beyond the narrow and artificial boundaries of his technical investigations. This viewpoint is incompatible with both public welfare and scientific advancement. The extent of the investigator's responsibility is particularly important in relation to drug products which may be sold to the professions or to the public or both. Investigators supplying laboratory or clinical data on such products should know how this information is to be used or misused, as the case may be. Much of the current false, fraudulent and misleading advertising of products sold to the profession and the public is a perversion of data obtained in recognized institutions. In other cases, the advertising is misleading because it consists of half-truths.

For centuries, clinical investigations of therapeutic agents have been carried out on a haphazard basis. Even today, there appears to be a strong tendency to follow the simple formula:

The patient is sick (or thinks he is).

A drug is given or applied.

The patient gets well (or thinks he does).

Therefore, the drug effected the cure.

Those who have followed clinical reports in the medical and dental literature cannot fail to be impressed by the number of papers in which considerable space is devoted to descriptions of symptoms and discussions of etiology of diseases, but in which treatment is considered as an afterthought. Unfortunately, these statements relating to treatment are often uncritical and practically worthless.

It is only within comparatively recent times that investigators in therapeutics have set up criteria for the evaluation of drugs. Six fundamental propositions involved in these criteria have been summarized by Klumpp[3] as follows:

1. Many diseases and symptoms are self-limited, regardless of what is done for them.

2. Nature heals and cures; drugs at best are merely adjuvants.

3. Chronic diseases are characterized by spontaneous remissions and exacerbations.

4. Symptoms are often entirely due to and almost invariably aggravated by worry and emotional disturbance.

5. Symptoms, regardless of their cause, are often temporarily improved through the expectation of therapeutic benefit.

6. The fallacy of *post hoc, ergo propter hoc* (after this, therefore on account of this) reasoning is evident.

This tendency to assign a cause and effect relationship to two or more events because of their occurrence in the expected sequence has been called by the philosopher Kant the primary basis for all human error.

It would be irrational and unscientific for those of us who have done dental research work to feel that we live entirely apart from this situation. The division of dental research is an entirely arbitrary one, and it is impossible to foresee when other fields will encroach upon it or when dental research will, of necessity, borrow from other arbitrarily segregated fields of science. Moreover, it must not be forgotten that dental research workers and other scientists must consciously and continuously be on guard against the human trait of using *post hoc* reasoning in designing experiments and in evaluating data. Scientific research does not consist alone in the collection of facts. Orderly arrangement of observations and the determination of their significance is of at least equal importance. It must not be forgotten that dental art is based upon dental science, and both

must conform to the rules of scientific evidence.

From this, it follows that there rests upon the investigator in the dental field the heavy responsibility of supplying useful information directly to the dental practitioner and indirectly to the public. On the one hand, therefore, it appears desirable to impress upon the dental research worker his responsibility to the profession and the public. On the other hand, it is absolutely essential that the need for support for dental research be impressed upon all of us.

To the Council on Dental Therapeutics has been assigned the stupendous task of protecting the dental profession and the public against fraud and imposition in connection with the sale of dental articles. Obviously, there may be at least two approaches to a task of this kind and they may be employed at the same time. The one consists in directing the attention to the status of these products in the light of scientific evidence; the other, in acquainting potential victims with the scientific rules which may enable them to separate the wheat from the chaff. In any event, and regardless of what method is used, we must always turn to scientific evidence and scientific procedures. Thus, the dental research worker plays a vital rôle in this program.

On several occasions, the Council has found it necessary to undertake consideration of products promoted as curative or preventive agents in dental caries. A number of the vitamin and mineral preparations have been promoted as increasing the calcium content and buffering power of the saliva. In some cases, data purported to have been obtained on a control basis have been presented in support of these claims. The rôle of the scientific worker in this connection is well illustrated by a recent report by Deakins *et al.*[4] In this report, it was shown that the interpretation of results of salivary analyses made by small groups is extremely difficult, no matter how they are approached. In another report, Becks *et al.*[5] failed to find any significant relationship between the calcium and phosphorus composition of resting saliva and the incidence of dental caries. It is obvious that critical findings of this character are helpful in evaluating claims made for products sold to the profession and the public. For example, the Council has considered a number of preparations promoted as cures for dental caries and for which it was claimed that the beneficial action results from the ability of the products to increase the calcium and phosphorus content of the saliva.

The experiences of the Council during the past twelve years may be of value to dental research workers and others in indicating the need for investigations along many lines. In the following, an attempt will be made to indicate some of the needs of the profession and the public in connection with dental therapeutics.

The most important need in this work, and indeed in all science, is intangible. It is intangible because human beings are doing the work, but it can be expressed by the term "the method of approach." This consists in taking the broad view of every problem in the light of public and professional needs; in considering problems dispassionately, but critically, and in employing in their solution the best available scientific procedures. From this, it obviously follows that there is no need for uncontrolled enthusiastic reports or testimonials in the guise of scientific reports.

It is a lamentable fact that the "blind test" technic was not used at all in studies on dental medicaments until comparatively recent times. One of the earliest reports of this kind showed clearly that a false indication of topical anesthesia can be obtained by placing a flavored solution of sodium chloride on the gums.[6] The report therefore was of

value because it not only contained facts of interest to dental practitioners, but also indicated a method of studying topical anesthetics more useful than any which had been employed in the dental field in the past.

The lack of suitable controls in studies on Vincent's infection is undoubtedly responsible for the numerous agents which have been enthusiastically advocated for the treatment of this condition. Recently, a Council referee had occasion to go through the literature on this topic. He was unable to find a single report in which the "blind test" technic or statistical methods were employed. Plainly, the favorable reports were based upon *post hoc* reasoning, which may or may not have been correct in any instance. This type of reasoning can also account for widely divergent opinions on the same drug. Questions relating to the etiology and classification of Vincent's infection were not brought into this discussion, even though they are important. In simple terms, it may be stated that if any given agent is said to be of value in the treatment of Vincent's infection, there should be proof for that statement. If the study was conducted without controls, the data accumulated cannot be considered proof. They may have been chance observations. The foregoing might apply almost as well to reports dealing with the use of drugs in the treatment of pyorrhea.

From the standpoint of the needs of the profession and the public, it is essential that the results of laboratory and of clinical investigation be translated into terms of practical usage. This often requires prolonged investigation, since the significance of many findings may not be immediately evident. On the other hand, many studies in the past have been conducted with an obvious disregard of practical considerations, even though the results have been used to bolster claims for products sold to the profession and to the laity. Numerous examples of this kind occur in connection with the class of products designated as germicides and antiseptics.

A few years ago, the Council had occasion to consider a product guaranteed to sterilize the dental handpiece. Claims regarding the product, which consisted essentially of a phenolic compound dissolved in a non-aqueous medium, were based upon a few simple tests of the phenol-coefficient type. One Council consultant actually performed tests with this product, using the dental handpiece. The preparation was found to be entirely worthless for the purpose recommended.

Another example of the misuse of incomplete and often insignificant data occurs in connection with the sale of mouthwashes to the public. Phenol coefficients for products of this class mean little or nothing. Even if we assume, for the sake of argument, that agents of this class destroy germs in the test tube and even in the mouth, there are still a number of important questions unanswered. What diseases are these preparations presumed to cure or prevent? What well-controlled evidence is there that the preparations actually do prevent, cure or mitigate these diseases? In the past, a number of agents of the mouthwash type have been promoted as cures for or preventive agents in dental caries. Convincing evidence of the efficacy of such products has never appeared. No matter how strong the laboratory evidence may appear to be, the final test is a satisfactory clinical trial. This simple truth appears to be worthy of emphasis at the present time.

A survey of the literature shows that a large number of preparations have been advocated as curative or preventive agents in caries. Direct evidence of their usefulness appears to be lacking. While a number of tests for susceptibility to caries or to caries activity have been developed, our present state of knowledge is such that complete reliance can-

not be placed upon them. Well-controlled clinical tests are still necessary for the evolution of preventive or curative effects, if any, produced by a large variety of agents suggested for the purpose.

In this connection, it is also appropriate to point out the need for the broad view of dental investigations, especially as these deal directly with patients. One clinician has aptly said, "The patient should be considered as a whole—not the mouth as a hole." Regardless of whether drugs are used in the hope that they may be of value in the prevention of dental caries, we cannot overlook the possibility that such products may have an undesirable or even dangerous effect on other parts of the body. Absorption of drugs through the oral membranes and reflex swallowing of drugs is an important topic for investigation. If vitamins and various foodstuffs are being considered as agents for the prevention or cure of dental disease, inquiry should be made to determine whether the body requires these additional factors. In the past and even at present, far too many mineral and vitamin preparations have been added to the diets of patients without a determination of the adequacy of the diet. The relationships between systemic and dental conditions represent a rich field for investigation.

During recent years, the dentist has shown great interest in sulfanilamide and related compounds, especially in connection with their local application. The status of these products in the light of the Council's rules has been the subject of several reports in THE JOURNAL.[7, 8, 9] It is unfortunate that, year after year, it is possible to come to only one conclusion regarding these substances; namely, that their usefulness in dental practice has not been established. There is good reason to believe that sufficient energy has already been expended in studies on these products to have produced more definite data. However, voluminous data without simultaneous bacteriologic tests and clinical controls are of little or no value in the formulation of opinions on these products. Comparison of results obtained this year, when sulfanilamide is used in tooth sockets, with the results obtained several years ago when sulfanilamide was not used may leave too much to the imagination.

It is recognized that the evaluation of drugs in the sulfanilamide group as topical medicaments presents difficulties greater than those ordinarily encountered in other clinical studies on these compounds. The growing body of evidence from the medical and dental fields indicates their probable usefulness to the dental practitioner. However, much more evidence is required before we can be in a position to indicate how and when these drugs should be used or which one of the numerous members of the group is best suited to a given condition. The dental practitioner must turn to the research worker for answers to these questions. To the research worker, whether he is a bacteriologist, histologist, pharmacologist or clinician, this present need for information represents an opportunity to perform interesting and useful work.

In this connection, it is well to point out that, several years ago, the local application of dyes was quite as popular as is local application of sulfanilamide today. Yet there is evidence that this use of dyes is being displaced by the employment of sulfonamide drugs. Perhaps this is as it should be, but it would appear to be far more desirable to make such changes on the basis of results obtained in comparative trials. Perhaps the dyes should be subjected to careful investigation. It would certainly be interesting to compare these agents with sulfanilamide or related compounds in the control of experimental local lesions in animals. The dyes have certain physical and chemical properties not shared by sulfanilamide, and some of these superior

properties should be taken into account in the investigations.

All of the foregoing must be considered as reflecting the views of an individual and not necessarily those of the Council on Dental Therapeutics. The Council cannot specify what tests should be made on any particular agent. It is limited in this respect to determining whether the data presented or otherwise available are adequate.

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ORTHODONTICS AS A HEALTH SERVICE

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THE scope of dentistry and its obligations have undergone a phenomenal expansion in the past quarter century. Formerly, dentistry consisted mainly of reparative services. The teaching process for dentists has evolved from flagrant charlatanism to empiric preceptorship, then into short proprietary courses, and finally to a truly educational approach as at present. Dentistry in America has developed as a separate profession, yet many are delighted to see a stronger alliance today with basic sciences and other fundamentals for all of us who claim to be an integral part of the great healing arts. While dentists as a professional group are as well informed and prepared, and as sincerely interested in doing their utmost and best, as any other professional group, "Progress is the law of the universe," and any one who will not bend his will to this law not only handicaps himself, but also grievously wrongs those whom he would serve.

Owing to the results of myriad clinical investigations and research studies, we now are forced to change many of our former ideas, methods, technics and plans. We have learned that some of the disorders and deficiencies of the mouth and teeth may produce serious, sometimes fatal, ailments in other parts of the body. Our responsibilities and opportunities now are greater than those of merely filling, extracting and cleaning teeth. Some of our past dental services, as judged by standards of good looks and stability, were actually harmful to the patient. Today we are cognizant that there are an increasing desire and a necessity to include dentistry as a health

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service; therefore, we must admit an imposing and more weighty responsibility on each conscientious member of the dental profession. While some dentists still prefer to have dentistry a strictly autonomous profession, surely most of us already feel that our profession has evolved into "the equivalent of an oral specialty in the practice of medicine" and public health. Many of us feel that, in the hopefully enlarged view of dentistry,

> Its practitioners would be trained to give the service not only of dental surgeons and dental engineers, as at present, but of oral sanitarians and oral physicians as well. Instead of examining only the teeth and mouth of a patient, as is now usually the case in a restricted view of their responsibility, they would also inquire into and keep careful records of the state of the patient's health, particularly as it affects or is modified by conditions of the teeth and mouth. Dentists would plan their procedures to meet not only the local indications, but also the possible requirements of extra-oral relationships; would also recognize and note the significance of outstanding symptoms of systemic disease, and warn or advise the patient accordingly, or explain his need for a physician's attention; and could effectively discuss, with a physician, the oral conditions in their relation to the patient's general welfare. Prevention of disease at all ages would become an inherent and predominant motive.

Since an adequate program for the prevention or alleviation of any morbid condition of human beings is always based upon the need for such service, surely it is encumbent upon us as doctors of dental surgery to inquire into one of the most important phases of our profession's work, orthodontics, and its relationship to illness and health; also its relationship to many other phases of dentistry. While no satisfactory and dependable picture has yet been presented of the oral condition of the nation, owing mainly to the difficulty encountered in a lack of uniform standards among those trained to make such a desirable examination, we all realize how vast a number of cases of oral anomalies, malformation, malocclusion and allied sequelae are seen. The roentgenogram has been too seldom utilized, and because of the taint of a better forgotten dental educational background, and competitive emphasis, the average dentist has been so busy with saying, "Open, open, open," and with what he found, that he has neglected to say, "Close, close, close," as he should have done. The evidence is undeniably sad as a dentist views the widespread dental decay and dental anomalies. He knows better than any one else that "decayed teeth and malformed jaws are by far the most common defects among school children." The great majority of school children become "dental cripples," with consequent damage to their health, much of which can never be fully repaired because we have not taught, worked and served as we can and should. In World War I, the number of dental defects was alarming, but, in this present time of national emergency, dental defects are so much worse that more than a fourth of the flower of American manhood cannot do their best for national defense because of the most widespread physical handicap known, dental defects; and yet we still fail to do our best.

The oral condition has always been the beginning of many of the infectious and contagious processes. We know how infection is spread, and the public is learning daily in spite of all of us. Some of the abnormalities appear early in life, but far too many are found at all ages. The most common diseases and defects are those associated with the mouth and teeth. The importance of deciduous teeth is still not sufficiently appreciated by either the profession or the laity. Toothache is still common among children and many absences from school are caused by it. For premature loss, the first permanent molar leads all teeth. The actual health aspects of dentistry are

local and systemic. Because of his training, knowledge and skill, the public expects the dentist to care for the entire mouth. True, the achievements in the field of so-called preventive dentistry are not so heroic or so numerous as in preventive medicine, but preventive measures have been developed that are fairly effective. The public is gaining a new concept of health, what it is and how to maintain as well as obtain it. The important rôle of the mouth and teeth places our profession high in the field of health service when one considers critically lasting public health. One of the fundamental principles of pathology is that disease results from a limited adaptability of an organism to its environment. Another fact well known now is that the range of adaptability of the organism to its environment may be increased. Prevention of dental disease is primarily a matter of education, not operative procedure, but dentistry can render important preventive service now in postponing various oral disorders and deficiencies or retarding their progress.

Dental service for children has long been the most neglected field in dentistry. The American Society of Dentistry for Children has done more than any other group or interest to focus the attention of the profession, the dental colleges and the public on this neglect.

Dentistry for children involves a thorough knowledge of the development of the natural denture; the principles of nutrition, with especial reference to the growth and maintenance of oral structures; and the effect of dental disease, the premature loss of the deciduous teeth, and the loss of the permanent teeth, on the development of the dental mechanism and the general health of the patient. The dentist should be able to use appropriate prophylactic, operative and restorative methods for the teeth of children, and he should know how to manage children so that he can perform the necessary dental procedures. He should be able to teach oral hygiene to children, both to individuals and to groups. Adequate dental service requires that the dentist have a substantial knowledge of orthodontics and considerable ability in the use of procedures for the prevention and treatment of malocclusion.

We all need to be more thorough in examination, in diagnosis and in treatment planning. All inspections and examinations should give full consideration to occlusion in all its aspects. The mouth as a whole must be the object of attention, not just the small segment acutely affected. The examination for malocclusion is just as important in health service as the detection of caries, periodontoclasia or other common dental disorders. It is our duty to call the attention of both the child and its parents to any oral anomaly.

The present statistical data indicate a prevalence of malocclusion of from 50 to 75 per cent in children and youth. Until recently, this alarming situation was not well known nor was its health significance appreciated. We have hope now that a new day is dawning for research, revealing the factors in the development of many malformations; and surely we have a more scientific foundation for dealing with these multiple problems of malocclusion. The study of speech suggests the importance of alinement of teeth as a factor in effective speech. Psychologists are daily showing the effect of unsightly physical defects on personality as well as on economic and social efficiency. The best thought in dentistry today demands early attention to the matter of preventive orthodontics. No youth who has malocclusion affecting his health and marring his appearance can be admitted to West Point, Annapolis or the Coast Guard School. This broadened concept of orthodontics as a health service places a responsibility on the whole dental profession. While orthodontics has been developed in America as a specialty, a considerable number of dentists in general practice include orthodontics in their service.

The prevention and early recognition

of malocclusion are direct responsibilities of the general practitioner in dentistry. If the general practitioner presumes to treat malocclusion, he has both a moral and a professional obligation to know what he is doing. Nearly all orthodontists were at one time general practitioners, and no specialty in dentistry has the God-given right to treat certain conditions; but while many general practitioners attempt the treatment or correction of all types of malocclusion, the same dentists would never attempt a cleft-palate or a harelip correction. To successfully serve the public in orthodontics, a dentist must know more than he is at present taught in the average undergraduate college training. The health of the patient is the responsibility of the whole dental profession, not any one group, appointed or otherwise. The question whether the demands for health service can be satisfied with preventive orthodontic service only by the general dentist, or whether the responsibilities make it encumbent upon dental colleges to teach all undergraduates enough orthodontics to equip them to practice the specialty intelligently and adequately, is one which has been, and will be, debated for some time to come.

The early recognition and correction of malocclusion enters into many services that the dentist renders in other branches of dentistry. It is now believed that malocclusion contributes to the development of caries, since teeth that are not in function are not well cleaned by natural means. That malocclusion, trauma, etc., are exciting or contributing causes of periodontoclasia has long been regarded as a truism. A complete health service by means of dental restorations is provided only when mechanical procedures and biologic factors are properly coordinated. This coordination can be made only by a dentist who, by training and experience, is prepared to understand all aspects of this important health service. At present, there is a tremendous gap between medicine and dentistry, almost a "no man's land." This gap has penalized not only medicine and dentistry, but also the public, whom we have sworn to serve and keep fit. The two professions, through their separate licensure and organization, have brought about an unfortunate situation in which physicians and dentists have often spoken different and separate languages. It has been observed that most of the blame for this lack of cooperation cannot be laid at the door of the dentist.

Physicians have traditionally neglected the mouth. Their training even today does not include adequate instruction on the oral cavity or its relationship to the general health. Consequently, dentists, as well as physicians, do not always appreciate the important relationships that we should have in the health services. This, as well as other neglected phases of our work in the healing arts, must be corrected before it is called into question. Special privileges, such as both medicine and dentistry enjoy, cannot long remain unless they continue to operate in the interest of the public welfare. No profession or group can afford to forget this important fact. There is a continuous trend in the direction of extending dental service to a larger group of the population. It now appears that the dental profession cannot escape this problem of adequate dental care for all the people. In our socialization progress, in the alarming conditions revealed regarding the dental defects of the selectees in our armed forces, in a closer and more sincere appreciation of folks instead of things, the problem of dental care for all the people will have to be dealt with by each generation. It is to be hoped that the dental profession can assist in this work in seeing that the public welfare is adequately served as well as in helping to develop an understanding of the social and economic relations of dentistry and a proper orientation of the profession. Organized medicine, organ-

ized dentistry and organized public health service must work in close and harmonious cooperation to solve the pressing health problems which confront us. Public interest and public health cannot well be served until there are interdependence and mutual respect among all branches of the healing arts. Both medicine and dentistry need to understand each other better and to learn the many ways in which they can be of assistance in preventing and combating the problems of disease.

In order to keep the record straight, assuring those of us in the dental profession of having honestly met our myriad obligations, it might be well to define, integrate and correlate both orthodontics and health service. Orthodontics may be defined as a branch of dentistry which has for its object the prevention or correction of oral anomalies and the harmonizing of the structures involved, so that the dental mechanism will function in a normal way. It is a study of growth and development which aims at the realization of anatomic and functional relationships of the dental mechanism. It deals with biologic problems which are solved in part by the use of mechanical appliances. In the past, orthodontics has often been regarded as a division of orthopedic surgery, the correction of congenital and acquired deformities. At one time, orthodontics included the special treatment of cleft palate and fracture. To be sure, orthodontics is employed in every phase of dentistry from surgery to final or partial restorative service. To separate orthodontics from dentistry would be most unfortunate for both dentistry and orthodontics. It has been my endeavor to stress the fact that we are recognized as professional men because we are considered an integral and necessary part of the healing arts. It is the individual as well as the aggregate responsibility of dentists and dentistry to offer a complete, not a partial, dental health service. All of us consider orthodontics an important and necessary part of dentistry's service. By the same reasoning, all dentists and orthodontists must frankly admit that it is our obligation to call the patient's attention to all oral anomalies and to work to prevent or eliminate the need for our professional service.

From a rational point of view, since orthodontics does constitute an admittedly essential part of dentistry, and dentistry *per se* exists because of its health service responsibility, more attention should be given to orthodontics along with other phases of dental service. It appears that the future general practice of dentistry will certainly include an increasing amount of orthodontics for public health, and surely no other single subject can do so much to correlate all the different subjects embodied in dentistry. To divorce orthodontics from dentistry in either the dental curriculum or general practice, or from its possibilities as a health service, would spell the decadence of professional integrity. Certainly there have been disagreements between orthodontists and dentists. They have been a form of growing pains. Much of the misunderstanding can be explained in part by history. Like many of the outstanding contributions to science and the profession of the healing art, orthodontics originated outside the general dental curriculum and was started as a specialty and not as a part of general dentistry. The past quarter century has witnessed, with an increasing pride and appreciation, the service that orthodontics can render to all phases of dentistry and to public health service. Dental colleges are today giving more and better undergraduate, graduate and postgraduate instruction in orthodontics, and we have ample evidence that orthodontics in the future will make even a greater contribution to dentistry and health service.

Dentistry has served for more than a hundred years as a profession. Its edu-

cational processes have evolved slowly, but satisfactorily. Dental literature is forcing recognition of dentistry in the realm of social sciences for the betterment of mankind everywhere. We have a hope now, not born of idealistic dreams, that endowments, research, scholarship and the cooperation of the sciences related to our own will actually give to mankind the dental health service that they are entitled to, one administered by professionally trained general practitioners who understand and appreciate all phases of our professional knowledge and its manifold benefits. All oral health service will then be preventive in that we shall be able to inhibit developing deficiencies and disorders quite as well as we now arrest the many pathologic processes. Prevention in dentistry today is an ideal which motivates all service that we seek to render, but, in the not-far-distant future, it may be that it will be our endeavor to understand the healthy mouth and strive to maintain the mouth in health, rather than repair it. We can mean what we say and put into practice educational principles possible of motivation and acceptance by the public that "prevention in dentistry may be defined as the efforts made to maintain normal development and physiologic function and to prevent diseases of the mouth and adjacent parts."

Life is a continual process of adjusting and adapting ourselves to our surroundings. Modern civilization has developed a strenuous competitive community life which places extraordinary demands upon health and the many factors which contribute to health. Dentists must realize that they have a responsibility in all phases of dental health service. Specialists must remember they are but parts of the whole, and all of us must face the fact that we fail as professional men and are not true to our trust unless we eternally strive to correlate all principles and methods of prevention employed in dentistry, applying them to all patients, taking into account the various periods of growth and development. Orthodontics has a place in dental health service. It is your, mine and our responsibility to see to it that boys and girls, men and women, have their chance to be healthy, happy and useful. May your answer be more smiling faces, better health, usefulness and service for our day and generation, as well as for those unborn millions, who may find life sweeter and fuller.

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HOW IS PYORRHEA CURED? A COMPARATIVE STUDY OF SEVERAL METHODS FOR TREATMENT OF PYORRHEA ALVEOLARIS

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SOME years ago, with Crane, we instituted a series of researches for the purpose of investigating the numerous results purportedly obtained with various methods for the treatment of pyorrhea alveolaris. In a previous communication,[1] we described the results of surgical elimination of the disease.

The purpose of the present contribution is to report the results of our comparative studies on teeth on opposite sides of the same mouth treated by different methods. Patients with extensive pyorrhea were selected in order to demonstrate clearly the changes in the gingival level following each of the methods employed. The teeth to be treated were so seriously affected that the prognosis with any form of therapy appeared distinctly unfavorable. In every instance, as a preliminary procedure, we recorded accurate data relative to depth of pockets, occlusal traumatism and degree of alveolar destruction. In later cases, amalgam fillings were inserted in the teeth at the gingival line prior to treatment, as illustrated in Figure 4. These fillings constituted fixed points and facilitated observations and measurements of alterations in the gingival level. When the maximum improvement had been attained, the treatment was discontinued and block-sections were removed in such manner that teeth, gingivae and alveolar process retained their normal relationship. (Fig. 1, B, C.)

The first patient, a man, aged 50, had pulmonary tuberculosis. A roentgenogram (Fig. 1, A) revealed a uniform degree of bony involvement around all the affected teeth. The pockets averaged 6 mm. in depth and the teeth were loose. The cuspid and lateral incisor on the one side were treated for four weeks by subgingival scaling and applications of perhexogen, a stable solution of alcohol and hydrogen dioxide. Stimulation was induced with toothbrush and toothpick. The cuspid and lateral incisor on the other side were left untreated, serving as controls. At the conclusion of treatment, the treated side exhibited marked clinical improvement, the gingival crevices being about 1 mm. in depth. Six weeks after the beginning of treatment, blocks (Fig. 1, B, C) were removed and studied histologically. The untreated side, as shown in Figure 2, A, presents nearly all the characteristics of a typical pyorrheal pocket. Here, the process can be compared with that seen in other pyorrheal pockets. (Fig. 3.) Marked improvement, with a satisfactory gingival crevice, is discernible upon the treated side. The epithelium is moderately hyperplastic, and there is still evidence of an inflammatory process in the underlying corium. The improvement was effected through loss of interproximal tissue by curettage and application of an escharo-

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tic, which resulted in reduction in the amount of edema, and cellular infiltration.

method, as practiced by Smith. His method consists of subgingival curettage, use of sodium sulfide, disocclusion

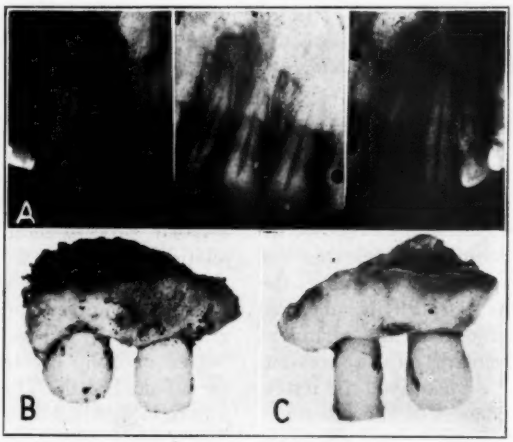

Fig. 1.—Uniform destruction of alveolar process around anterior teeth. B, untreated side. C, treated side. Increase in size of the clinical crown is evident.

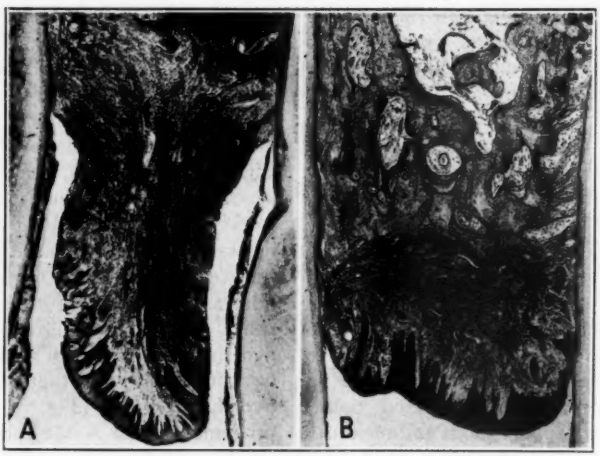

Fig. 2.—Comparison of interproximal tissue of untreated and treated sides from same mouth. A, untreated; showing extreme depth of pockets and presence of calculus. There is a hyperplasia of the gingival epithelium. B, treated. Although there is some improvement, the epithelium is still hyperplastic. Inflammatory reaction is evident in the corium.

The next patient afforded the opportunity for a contrast between the surgical method and a so-called conservative

of teeth and gingival massage as advocated by Stillman and McCall,[2] and, in addition, stimulation with a toothpick.

Roentgenograms (Fig. 4, A) and a photograph (Fig. 4, B) taken prior to treatment show amalgam markers inserted in teeth at the gingival line. The roentgenograms indicate an equal amount of bony destruction around the six anterior teeth. A photograph made immediately after surgical treatment of the photograph shows that the teeth treated by Smith have been ground out of occlusion as recommended by Stillman and McCall. There was no grinding of teeth on the side treated surgically. Another photograph (Fig. 5, B), taken upon completion of treatment three months later, revealed little or no difference in

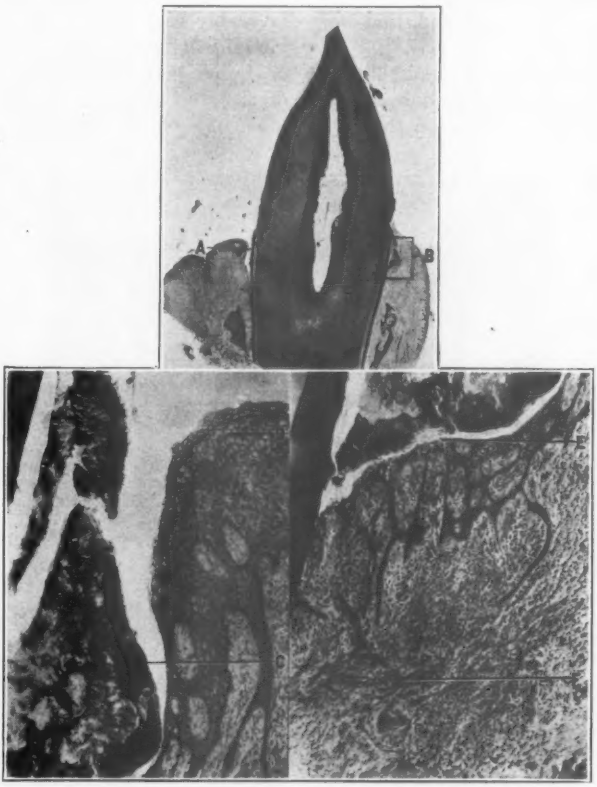

Fig. 3.—Pyorrhea alveolaris. Deposits of calculus are seen at A and B. The gingival epithelium is hyperplastic and edematous at D and the large deposit of calculus is shown at C. There is ulceration at E, which is the base of the pocket. Remnants of the free gingival fibers are seen at F.

the one side of the mouth, and after an initial treatment of the opposite side by Smith, reveals a manifest difference in the gingival margin (Fig. 5, A.) Moreover, gingival contour. The distance between markers placed in the teeth before treatment was begun and the new gingival line showed that the loss of tissue was

almost identical on the two sides. Any slight difference was attributed to minor variations in depth of the original pockets. The two sides presented a uniformly fair clinical aspect. The comparison was even more impressive in examination of blocks removed from the mouth. (Fig. 5, C.) It would appear that exposure of the clinical crown is approximately the same with either method if the depth of the pockets is the same and they are entirely eliminated.

A photomicrograph of a labiolingual section of the cuspid treated by Smith shows the amount of recession from the level indicated by the artefactual marker. (Fig. 6, A.) Higher magnification of the labial gingiva (Fig. 6, B) reveals some separation of the soft tissue from the tooth, but, save for a somewhat excessive degree of lymphocytic infiltration, the tissue is satisfactory. On the lingual side (Fig. 6, C), there is marked hyperplasia of the epithelium, together with a severe chronic inflammation.

A labiolingual section of the left cuspid, which was treated surgically (Fig. 7, A), shows an increase in length of the clinical crown, as indicated by the position of the marker. Here, there is some separation of tissue from the tooth incident to preparation. The labial side (Fig. 7, B) exhibits a satisfactory appearance. The lingual side (Fig. 7, C) shows evidence of a mild inflammatory reaction, but the general condition compares favorably with that of the opposite lingual side. (Fig. 6, C.)

Higher magnifications of the gingival crevice and epithelial attachment on the labial side of this tooth were made from two other sections. (Fig. 7, D, E.) These show the new epithelial attachment in contact with the dentin in areas where the cementum had been destroyed. Sections of the interproximal spaces were essentially identical on the two sides of the mouth and were comparable with sections of the lingual side in appearance.

A striking example of the contrast noted following treatment was seen in a

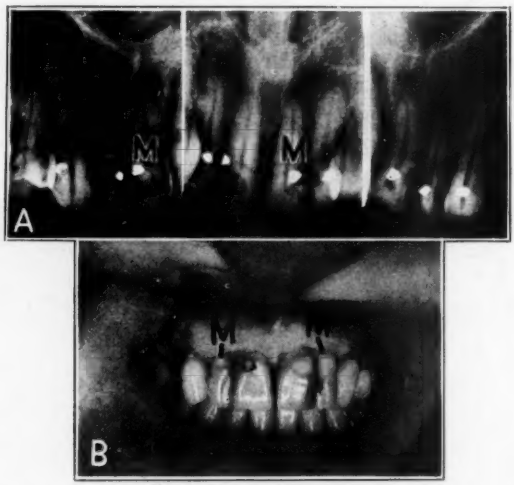

Fig. 4.—Amalgam markers (M). There is uniform destruction of the alveolar structures. B shows markers (M) in place before treatment.

third patient, who had extensive pyorrheal involvement of the remaining anterior teeth and bicuspids. (Fig. 8, A.) In this instance, the pockets likewise averaged 6 mm. in depth. Markers were inserted in the manner already described. The central and lateral incisors were treated by Smith. One of us (H.K.) scaled the cuspid and bicuspids thoroughly under local anesthesia. These

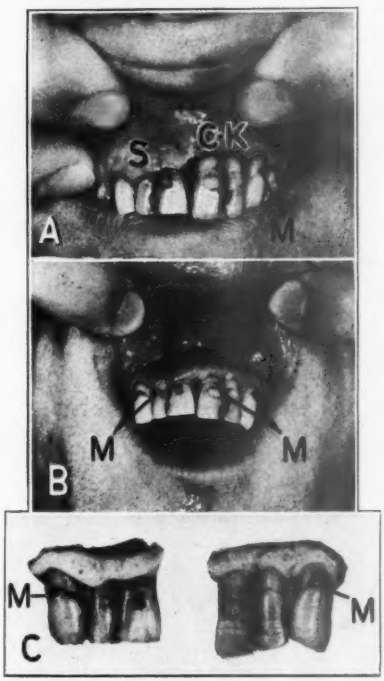

Fig. 5.—A, appearance after first treatment by Smith (S). (Compare with result after surgical operation (C-K).) B, removal of blocks for histologic study. C, blocks after removal.

teeth were then medicated with oxyiodine, a combination of perhexogen and iodine and packed with surgical cement, which was allowed to remain in place for ten days. Photographs of the affected teeth again reveal the marked degree of recession following treatment. (Fig. 8, B, C.)

Labiolingual sections of the incisor region showed a fair result on the labial side, but, as in the previous case, the lingual side is not as satisfactory. (Fig. 9, A, B, C.) Labiolingual sections of the cuspid region showed a satisfactory labial gingiva, while the lingual gingiva approximated in appearance that of the incisor region. (Fig. 10, A, B, C.)

Sections of the interproximal area of the incisors revealed in certain places almost normal gingival tissue, although a marked disturbance was perceived at other points. (Fig. 11.) In one interproximal space where the gingival crevice is approximately normal (Fig. 11, B), the underlying tissue shows moderate cellular infiltration and, immediately above the crest of the alveolar process, several sequestra (Fig. 11, C) can be seen. Unless these are destroyed by osteoclasts, they finally reach the bottom of the crevice and are exfoliated. Sections of the interproximal spaces of the right cuspid and bicuspid regions (Fig. 12) show tissue as nearly normal as that which received frequent and protracted treatment in the incisor region, with the exception of a single area in which a well-defined pyorrheal pocket persisted.

In a fourth patient, roentgenograms revealed approximately the same degree of involvement around six anterior teeth. The cuspid and lateral incisor on one side were treated surgically, and those of the opposite side by electrocoagulation, according to the technic devised by Webb.[3] As can be observed from a photograph taken after three months of treatment, both sides appear to have responded favorably, there being no evidence of pockets. (Fig. 13, A, B.) On the side that was treated surgically, there was an excellent result, save for the presence of hyperplastic epithelium on the interproximal surface and a moderately severe inflammatory reaction. The distal

surface is much more satisfactory. (Fig. 14.)

The interproximal spaces on the coagulated side show an inflammatory reaction throughout the deeper tissues (Fig. 15, A) and, at one point, a comparatively large sequestrum is in process of exfoliation. (Fig. 15, B.) The tissue that surrounds this sequestrum shows histologic alteration as a result of the employment of an electrode for coagulation.

Here also, the distal surface is more satisfactory. (Fig. 15, C.) The hyperplasia of the interproximal epithelium noted here, as well as in the previous photomicrograph, is believed to be due to the use of toothpicks in treatment. Controlled investigations of this reaction are at present in progress.

Fig. 6.—Labiolingual section of cuspid treated by Smith. A, marker M indicates original gingival margin. B, higher magnification of labial section (LA). There is some calculus and inflammatory exudate. (Compare with gingival tissue in Fig. 2a.) C, higher magnification of lingual section (LI); showing hyperplastic epithelium, calculus and inflammatory exudate in corium.

In order to study the effect of sodium sulfide upon the tissues, Smith applied this medicament to pockets around the

upper incisors of another patient. He administered the treatment on four different occasions at intervals of three days, using saturated cotton-packs, which were permitted to remain in place for ten minutes each time. Immediately following the final application, the block was removed. Sections of this block (Fig. 16) show not only that the epithelium which lined the pocket was destroyed by the sodium sulfide, but also that the connective tissue which supports the gingival crest was altered.

Fig. 7.—Labiolingual section of cuspid treated by surgical method. A, marker M, original gingival margin. B, higher magnification of labial (LA) gingivae, showing satisfactory gingival margin. C, higher magnification of lingual (LI) gingivae. The gingival and crevice epithelium is hyperplastic. Sections of crevice epithelium are shown in D and E.

SUMMARY

Our results seem to indicate that following any successful method of treatment, regardless of the intent of the operator, the gingival crest is situated approximately at the point on the tooth which coincides with the bottom of the previously existing pocket. This appears

logical when it is considered that the normal attachment of supporting tissues to the tooth is immediately below the bottom of a pocket.

The criticism that surgical treatment causes disfigurement by increasing the length of the clinical crown is unwarranted, since this increase in length may follow any form of treatment that eliminates the pockets. This was shown by means of fixed markers.

Sodium sulfide destroys not only epithelium, but also subepithelial tissues. Curettage in conjunction with the application of this medicament gradually removes the tissue which forms the pocket.

Electrocoagulation rapidly destroys the tissue which forms the pocket. However, there is evidence that this tissue destruction is difficult to control, whereas, when the surgical method is employed, the amount of tissue to be removed can be kept within desired limits.

The improvement following other conservative methods was equally marked when other medicaments were substituted for sodium sulfide.

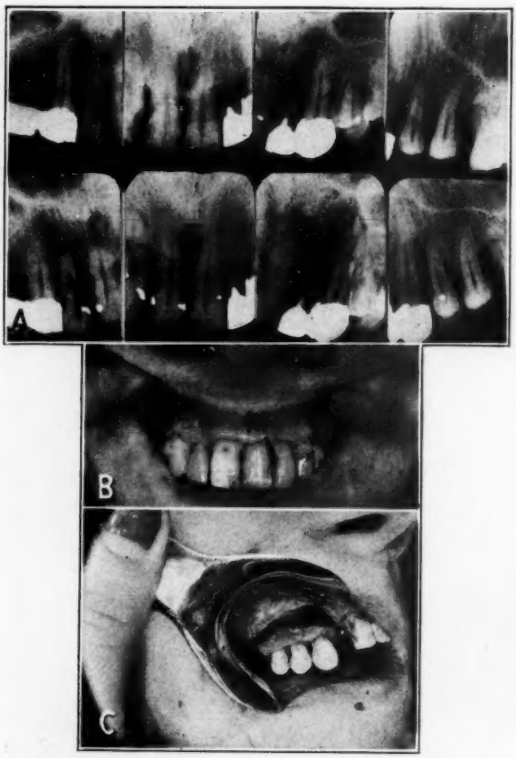

Fig. 8.—Comparative treatment by two conservative methods. A, roentgenograms before and after insertion of amalgam markers. B, after completion of treatment (Smith). C, block being removed; teeth treated by scaling, medicament and surgical pack.

When the surgical method is employed in conjunction with packing, patients, as a rule, complain of less pain than when escharotics and scaling alone are utilized and no surgical packing is applied.

In several cases, it was observed that treatment produced a more normal result in the labial gingiva than in the lingual and interproximal gingivae. It is possible that this difference is due to the fact that the labial gingiva is comparatively accessible and is therefore more readily cleansed and stimulated.

CONCLUSION

Satisfactory results can be obtained in the treatment of pyorrhea alveolaris by any of the several methods designated herein, through the elimination of the tissue which forms the pyorrheal pocket and the establishment of a normal gingival crevice at the point where the base of the pocket was previously situated.

With all methods studied, what appears to be a new epithelial attachment occurs, provided the pocket has been eliminated.

Connective tissue does not reattach

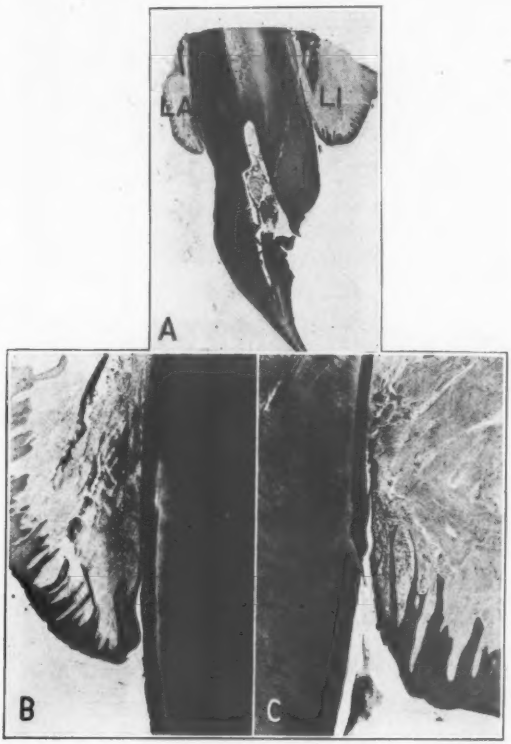

Fig. 9.—Labiolingual section of incisor (treated by Smith). A, low power (LI) lingual section and (LA) labial section. B, higher magnification of labial section; showing hyperplastic epithelium and exudate. C, hyperplastic epithelium lining lingual crevice.

itself to the cementum of the tooth following removal of the epithelial lining of the pocket. In view of the manner of attachment of the fibers of the peridental membrane to the tooth, it is difficult for new fibers to become embedded in old cementum. To accomplish this, new cementum must be formed from existing cementoblasts. This is difficult in the face of an existing inflammatory process.

The elimination of pyorrheal pockets does not occur in consequence of reattachment of connective tissue, as has been so frequently asserted, but by virtue of the removal, regardless of method, of the tissue which forms the pockets. Heretofore, this has been difficult if not impossible to recognize because of failure to employ fixed markers.

Harold Walter Krogh cooperated in the treatment of certain of the patients by electrocoagulation, and Louis Milobsky aided in the treatment and postoperative care.

The histopathologic work was done by the Registry of Dental and Oral Pathology of the American Dental Association, Army Medical Museum, Washington, D. C.

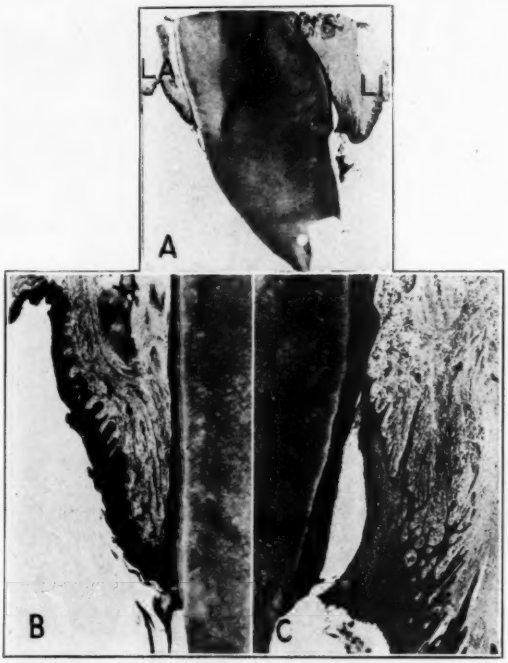

Fig. 10.—Labiolingual section of cuspid treated by scaling, medication and surgical packing. A, labial (LA) and lingual (LI) sections. B, labial section showing satisfactory gingival margin. C, hyperplastic lingual epithelium with evidence of inflammatory reaction in corium.

All photomicrographs were made at the Army Medical Museum. Figure 3, from the "Atlas of Dental and Oral Pathology," is used with permission of the American Registry of Pathology.

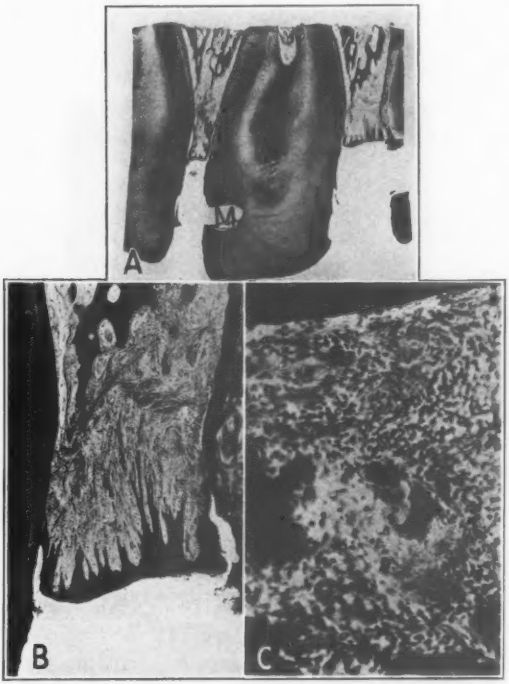

Fig. 11.—Section of interproximal spaces (treated by Smith). A, marker M, original gingival margin. B, higher magnification of right interproximal space (A). C, higher magnification of same area.

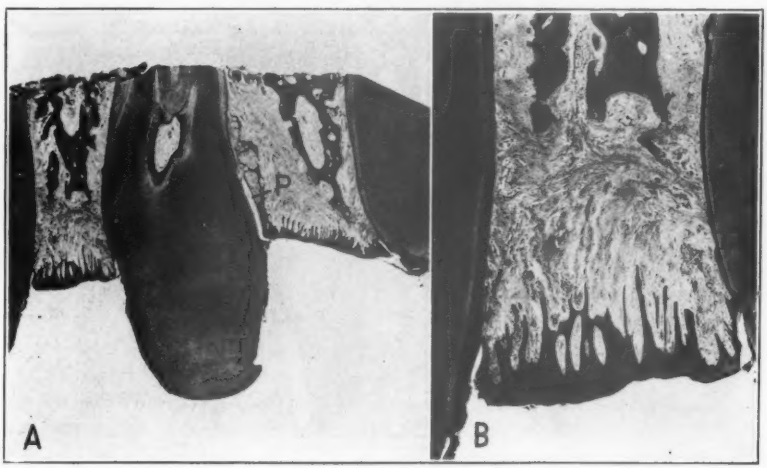

Fig. 12.—Section of interproximal spaces treated by scaling, medication and surgical packing. A, gingival crevices at several places. They are satisfactory, but, at P, a pocket remains. B, higher magnification of left interproximal space, which appears nearly normal.

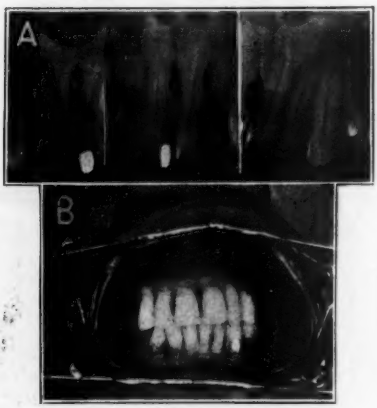

Fig. 13.—Comparison of surgical and electrocoagulative treatments. A, roentgenograms of area before treatment, showing extensive destruction of supporting tissue. B, after completion of treatment, one side treated surgically, other by electrocoagulation.

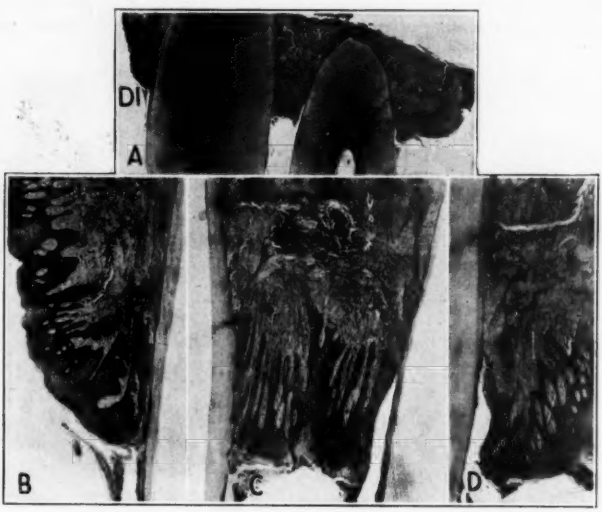

Fig. 14.—Surgical treatment. A, low magnification, distal (DI) section. B, C, D, higher magnification.

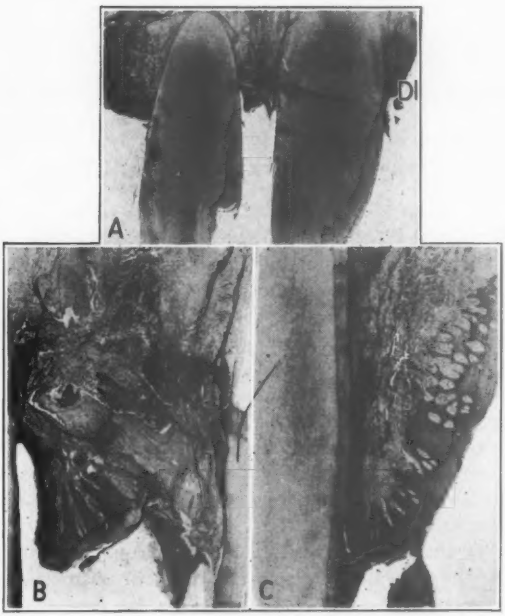

Fig. 15.—Electrocoagulation. A, low magnification, distal (DI) section. B, sequestrum. C, fairly satisfactory crevice and attachment.

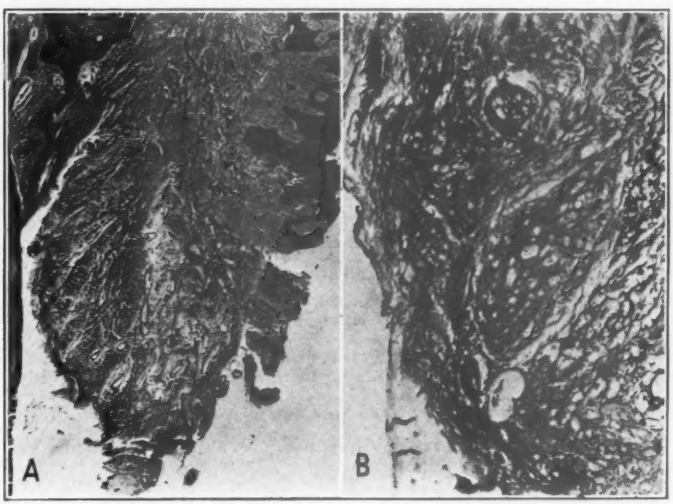

Fig. 16.—Effect of application of sodium sulfide. A, epithelium destroyed. B, higher magnification of same area.

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PRINTED INSTRUCTIONS FOR PATIENTS

By Stephen P. Mallet, D.M.D., Boston, Mass.

ORAL postextraction instructions to a patient are often forgotten by him owing to nervousness and anxiety regarding the possible consequences of the extraction, and, to meet this situation, some dentists have instructions typed by their secretaries and given to the patient as he leaves the office. Others have mimeographed or printed sheets bearing general instructions for postextraction care. The sheet is headed by the dentist's name and address, the date and a blank for the insertion of the patient's name. At the time that the patient is given this sheet, the dentist writes in supplementary instructions, if any, and deletes those portions not pertinent, using heavy black crayon to guard against mistake. He also retains for his file a duplicate—which may serve as a means of protection, legally, should the patient at some later time assert that no postextraction instructions were given him.

The average case is covered by the general instructions, but when, in a special case, further instructions are needed, it is easier to add them than to take the time for the preparation of a whole new sheet. I use chart A for general postextraction care in home or hospital.

Because of their legibility, the printed instructions are better than the mimeographed, and they are relatively inexpensive, costing only about a cent a sheet, or a little less.

The patient is grateful for these clear and concise instructions. They not only put him at ease, a matter of no little concern, but they are most helpful to the person who has to take care of him in his home. This also means that the dentist is less liable to have disturbing telephone calls at his office or home from a patient who is excited and confused or has forgotten the oral instructions given him at the time of extraction.

Chart A

INSTRUCTIONS FOLLOWING EXTRACTION

1. Continue to bite into gauze sponge placed in your mouth over wound immediately after extraction for one-half hour. No further gauze bite should be necessary.
2. Do not rinse for twenty-four hours. After twenty-four hours, you may rinse with warm salt water, one teaspoonful to a glass of water, five times a day for three minutes each rinse, for two or three days.
3. Nourishment should consist of any beneficial foods desired.
4. Apply icebag to face twenty minutes out of every hour from 8:00 a.m. to 8:00 p.m. for..... days or.....hours.
5. For pain, take:
   (a) Every two or three hours, 5 gr. of Empirin Compound; not more than five a day.
   (b) One or two Nembutal and Aspirin capsules (Nembutal-½ gr. and Aspirin-5 gr.), as needed for pain.
   (c) Call me if real emergency exists.

CHART B

HOME OR HOSPITAL INSTRUCTIONS FOLLOWING EXTRACTION

1. Absolute bed rest with avoidance of all exertion. Have a special nurse in attendance, and allow no visitors except immediate family. Alcohol, solid foods and tobacco are forbidden. A complete night of sleep is essential. Conversation to be avoided.
2. A bowel movement every day and an enema or night cathartic, if bowels do not move.
3. Icebag to face one-half hour out of every hour from 8 a.m. to 10:30 p.m.
   (b) Vaseline to face and hot water bag to face one and one-half (1½) hours out of every two hours from 8 a.m. to 10 p.m.
   (c) Vaseline to face and hot flaxseed poultices to face (high or low) constantly from 8 a.m. to 10:30 p.m.
4. *Diet:* Only the following: Starting at 8 a.m. and continuing until 8 p.m., alternating every hour, 8 ounces of orange, grapefruit, tomato juice and milk. Also, if desired, egg yolks, spinach, carrots, lettuce, grated raw cabbage, raw tomatoes, peas and string beans.
5. A bed bath each day and three alcohol rubs.
6. Hot water bag to feet if cold.
7. Take 3 to 6 five-grain tablets of Empirin Compound, intermittently, daily.
8. One heaping teaspoonful of Citrocarbonate at 11:30 a.m. and 4:30 p.m.
9. Nembutal and Aspirin (1 capsule of Nembutal one-half gr. Aspirin, 5 gr.) Codeine sulphate or Morphia for sleep.

CHART C

THE BOSTON CITY HOSPITAL

THE ORAL SURGERY DEPARTMENT

FRACTURE DIET

Revised to February 1941, by Stephen P. Mallett, D.M.D., Oral Surgeon-in-Chief

EAT ONLY THE FOLLOWING FOODS:—

All foods *not* mentioned in the following two lists should *NOT* be eaten.

"A" LIST—The following foods *must* be eaten daily:

1. Milk (whole), 1 quart.
   Choice of one—
2. Tomato juice, about 16 ounces.
3. Grapefruit, fresh, 8 ounces.
4. Orange juice, fresh, 8 ounces and juice of 1 lemon.
5. Butter, ¼ pound.
6. Eggs, yolks of two, preferably raw or soft boiled; whole eggs may be taken as in eggnogs or custards, sweetened with raw or brown sugar.
7. Vegetables, pureed, strained or mashed, such as: spinach, swiss chard, beet greens, carrots, summer squash, parsnips, turnips, peas, string beans, lima beans, corn, asparagus, and beets.
8. Cod liver oil: Adults, 2 teaspoonsful three times a day; children, less.
9. Yeast cake, 1 a day, or 3 vitamin B complex capsules.

"B" LIST—Optional foods *may* be eaten:

1. Banana, one ripe, mashed or taken with cereals or cooked fruits or with custard.
2. Cereals, Ralston, cornmeal, wheatena with milk and brown sugar, honey, maple syrup, butter or ripe banana.
3. Desserts, ice cream and only vanilla, chocolate or caramel; also custards, gelatine, apple sauce canned peaches and pears.
4. Cheese, cottage and cream cheese in moderation, if desired.
5. Meats, beef or chicken scrapings in broth.
6. Fish, halibut, cod, swordfish, haddock (boiled and shredded very fine and taken in milk as a gruel or broth).

EAT NO OTHER FOODS

N. B. Certain cases need more vitamin C and, therefore, one or two tablets of ascorbic acid may be added. Also anemia test should be made and iron administered if found needed.

Avoid all condiments, coffee, tea, and alcohol. Two weeks after fixation, sherry wine may be prescribed in case of loss of appetite.

CHART D

POSTOPERATIVE ORAL SURGERY
(Fractured Jaw Diet)

Approximately 215 gm. carbohydrate; 75 gm. protein; 120 gm. fat; 2,240 calories (This includes 1 tblsp. cod liver oil daily).

6 a.m. Milk, 1 cup (6 ounces).

8 a.m. Hot cereal with 1 level tbsp. butter (1 ounce).
1 egg, soft cooked.
Orange juice, ¾ cup (4 ounces), taken at end of meal.

10 a.m. Eggnog (1 egg, 6 ounces milk, karo corn syrup, 1 tbsp., vanilla to flavor).

11 a.m. Grapefruit juice, 1 glass (8 ounces).

12 m. Tomato juice, 1 cup (6 ounces).
Creamed green vegetable soup (milk, 6 ounces; pureed green vegetable, 2 ounces; butter, 1 level tblsp.).
Strained or mashed vegetable, 2 ounces plus 1 level tbsp. butter.
Ice cream or custard (6 ounces milk) sweetened with 1 tbsp. karo.

2 p.m. Juice of 1 lemon plus 4 ounces orange juice, sweetened with 1 tbsp. karo.

4 p.m. Creamed tomato soup (tomato juice, 4 ounces; butter, 1 level tblsp.; milk, 2 ounces).
Cottage or cream cheese.
Peaches, pears, applesauce or jello.

5 p.m. Tomato juice, 1 cup (6 ounces).
Broth with 1 ounce minced beef or chicken, or
strained fish chowder, 6 ounces with flaked white fish.

6 p.m. Sliced or mashed banana.

8 p.m. Milk, 6 ounces.

Cereals Allowed

Ralston
Cornmeal
Wheatena

Vegetables Allowed
Pureed, strained or mashed

Spinach, Turnip, Carrots, Corn, Swisschard, Peas, Beets, Lima beans, Beet greens, Parsnips, String beans, Summer squash, Asparagus

Ice Cream Allowed

Vanilla
Chocolate
Caramel

Sweetenings Allowed

Brown sugar, Honey, Dark karo (blue label), Maple syrup

Addition to Diet

Cod liver oil, 2 tsp. 3 times a day (children, less).

Yeast cake, 1 a day, or 3 vitamin B complex capsules. In certain cases needing more vitamin C, 1 or 2 tablets of ascorbic acid may be added.

Iron may be administered as needed.

Avoid all condiments, coffee, tea, alcohol. Two weeks after fixation, sherry wine may be prescribed in case of loss of appetite.

Water is to be given after each feeding.

I have found charts B, C and D to be the most useful. Chart B is a home or hospital instruction sheet for subperiosteal abscesses.

Chart C is a home or hospital instruction sheet covering diet for fractures, and chart D is the same diet adapted to hospital or nursing care.

I do not recall having seen in any of the dental journals this idea of printed instructions for the patient, though no doubt many dentists use them as a part of their office routine.

358 Commonwealth Avenue.

DENTAL SERVICE IN A HEALTH CENTER

By Esther Jacobs,* Philadelphia, Pa.

THE dental service of the community health center is one part of a complete program, set up primarily for the prevention of disease. It was organized in 1921 and is supported entirely by the Federation of Jewish Charities of Philadelphia, a participant of the United Charities Campaign. The dental department is one of four departments, the others being medical, mental hygiene and health extension.

The services of these various departments are for dependent Jews, both children and adults, being assisted by any one of the social agencies, who take the initiative in referring their clients to the community health center for a complete health survey. The patients return at more or less regular intervals of six months or one year for physical checkup. Originally, our services were confined to the clients of member agencies within the Federation of Jewish Charities, but its function is now being more liberally interpreted to include other social agencies interested in the Jewish dependent group. There are no fees charged, since, as already noted, all clients must come to us through a social agency cognizant of their economic status.

The community health center thus functions as a cooperative agency, deriving its patients entirely from other social agencies, to whom complete reports of all findings and recommendations are sent. The services are not open to the general public.

It is important to explain that the patients, with but few exceptions, come to the dental clinics through the medical diagnostic clinic. In other words, our diagnostic health examination includes complete dental examination, and this, in turn, is followed by complete dental treatment. The medical findings are always made available to the dental staff. Since we are primarily interested in the prevention of disease, we are concerned not only with the patient's dental health, but with his physical and mental health as well.

The work in the medical clinic is entirely diagnostic. The complete health survey includes routine urinalysis and a Wassermann test. Hemoglobin or complete blood counts, tuberculin tests and vaginal and oral smears are also a part of the laboratory service provided where indicated in the individual case. In the medical department, all defects are noted and the patient is directed to the treatment clinics in the various out-patient departments throughout the city. The percentage of correction of defects is between 70 and 72, not including the dental defects that are corrected in our own dental clinics. Obviously, this high percentage of corrections is only possible because of the cooperation of the many medical resources in the community, to whom our patients are referred through their social service departments. There were twenty-eight such community medical resources utilized during 1940 in securing these corrections.

Our mental hygiene staff consists of a part-time psychiatrist and a full-time psychologist. The former handles problems of behavior and maladjustment; and, through the latter, educational and vocational guidance services are provided

*Executive Secretary, Community Health Center.

for the prework group, as well as diagnostic psychologic services for individuals of all ages.

The health extension department is entirely educational. The aim is to give a working knowledge of fundamental health rules for everyday use, and to stress the preventive phases of health work. Talks by specialists on a wide range of health and mental hygiene topics are provided for groups of varied ages and interests throughout the community. A trained nutrition worker gives volunteer service two periods each week, and there is continuity of the educational program through the physician during physical examinations, and the dentist and oral hygienist during treatment.

I have given a description of the community health center program in some detail because it seems helpful to have a complete picture of all the services and their coordination as a background.

The object of our dental study was to determine just what the clinics were accomplishing in terms of actual service. We wished to know (1) something about the population according to age groups, (2) the number of carious teeth in new patients and (3) the number in return patients. We were interested in the number of visits required for completion, both for children and for adults, and just what percentage of patients continued to completion. We were interested in knowing to what extent appointments were kept. Since we have had a number of refugee clients referred to us from time to time during their resettlement period, we were also interested in knowing how their dental picture compared with that of the regular non-refugee group.

The full-time dental staff consists of a dentist, an oral hygienist and a dental clinic assistant. In addition, during 1940, eight volunteer dentists each gave one clinic a week. The volunteers are all graduate, practicing dentists. They work under the supervision of the full-time dentist, Dr. Gertrud Tank. Dr. Gustav C. Tassman, chairman of the dental committee, is responsible for the organization of the dental department and its entire program.

There are three dental rooms, each equipped with chair, cabinets, etc. Two clinics are utilized by the dentists and the third is used by the oral hygienist.

On his first visit to the dental clinic after his physical examination, the patient receives a complete dental examination, a complete or partial prophylaxis (depending on the condition of his mouth) and, if possible, either fillings or treatment as indicated. The amount of work naturally depends on the age of the individual and his ability and willingness to accept treatment. Frequently, the first visit, and sometimes succeeding ones, are devoted only to having the patient get acquainted with the clinic and staff, in an effort to establish a friendly contact and develop confidence.

Our dental program includes fillings, root-canal work, extractions, treatment of diseases of the gingiva, instructions in care of the teeth and prophylaxis. Roentgenograms and some dentures are made in the office of the chairman of the dental committee, Dr. Tassman. The mouths of those patients requiring dentures are prepared in the clinics at the community health center, and the dentures, for which there is a nominal charge, are paid for by the referring agency.

We selected the year 1940 for the study because we wanted a full twelve-months picture, and also because we wished to allow enough time for completion of long-treatment cases. We included only those cases, both new and return, in which treatment had been started in any one of the twelve months of that year, but did not include cases in which treatment had been started in 1939 and which were carried over into 1940 for the completion of treatment; nor did we include cases of adults having full upper and lower dentures. Thus, it will be understood that the 1,451 persons included

in this study do not represent the total dental population for the year 1940.

In the 1,451 cases, there were 900 (or 62 per cent) children; that is, persons up to and including 16 years of age; and 551 (or 38 per cent) adults, those 17 years and over. When we resolved the total into age groups, we found that 13 per cent were under 6 years of age, 26 per cent were from 6 to 12 years, 23 per cent were from 13 to 16 years, 12 per cent were from 17 to 21 years, 4 per cent were from 22 to 30 years and 22 per cent were over 30 years.

Of the entire total, 293 (or 20 per cent) were refugees; but when we analyzed the refugee group, we found that 171 (or almost 59 per cent) were adults, as compared with 38 per cent adults in the population as a whole, and 33 per cent in the non-refugee population.

There are some general facts about the total dental population that seem both interesting and important, and that will give a more comprehensive picture of the work of the Dental Department as a whole; which, after all, is necessary as a sort of backdrop for some of our findings.

The community health center, because it is a cooperative agency, closes its cases only when it is notified that the case has been closed by the referring social agency. In the dental department, if the case is closed by the agency before the dental service is completed, we continue with the treatment until completion, provided the patient keeps the appointments given.

We might explain at this point that all patients are seen by appointment, and attendance is affected by several considerations. One is the problem of missing school sessions for that age group; second, the matter of carfare, which is a real consideration to families on relief and is often a very definite cause for non-attendance. Finally, of course, sickness not infrequently prevents a patient from coming at the appointed time.

Only the nursery school group (slightly less than 10 per cent of the 1940 population) are brought to the dental clinics, the remainder being individually responsible for keeping their appointments.

There is no doubt that the keeping of appointments, which naturally results in the completion of treatment, is affected to some extent when the referring agency closes the case in the midst of treatment. We found, for instance, that only 21 per cent (or about one-fifth) of the completed cases had been closed during treatment, while 37 per cent (or more than one-third) of the uncompleted cases had been closed.

By completion, we mean that all dental defects have been corrected, with fillings, root-canal work, treatment of the gums, etc. Cases are completed for either three or six months on the following basis: Children who still have deciduous teeth, and those children who no longer have deciduous teeth, but whose permanent teeth show a tendency to early decay, are brought back in three months. Adults whose teeth are in bad condition on their initial visit to the clinic are also told to return at three-month intervals after completion in order to prevent, as far as possible, a recurrence of the original condition. All patients treated for gingivitis or pyorrhea are asked, upon completion, to return in two or three months in an effort to control these conditions. All cases were classified as "completed" regardless of how many visits or what length of time was involved from the time of the initial visit to the first completion; and "not completed" means just that, regardless of the number of visits made to the clinic or the length of time consumed.

In the total of 1,451 cases, we found that 841 (or 58 per cent) were completed, but when we separated children from adults in this total group, we found that 69 per cent of child cases and 38 per cent of adult cases were completed. In the refugee group as a whole, that is,

both children and adults, 50 per cent of cases were completed, while in the non-refugee group, 60 per cent of the total number of cases went on to completion. As previously mentioned, there were many more adults in the refugee group than in the non-refugee group. Since beginning our study, Dr. Tank has made a point of discussing with those refugees with whom she has had contact their reasons for not returning, and she reports that, in many of the cases, the patient has secured work and has continued treatment to completion with a private dentist. Naturally, this sounds very encouraging, but we have no actual statistics to confirm this impression.

In considering the high percentage of completed cases (69 per cent in the children's group), it is important to realize that in this group, particularly in the lower age level of the preschool children, that is, between 2 and 3 years, there are a number of mouths in which no caries is found and only prophylaxis is necessary. This means only one visit. In the 1940 children's group, including all ages up to and including 16 years, 26 per cent, or more than one-fourth, were in the negative classification. However, in the new cases, the greatest number of negative cases were in the under 6 years group, while, in the return cases, the greatest number were in the over 6 year group, which would seem to indicate that the early dental care on many of these children had been effective.

This picture of decrease in caries in return cases seems to prevail in each of the categories except in the group with three or less cavities. For instance, in new cases, 12 per cent had three cavities or less; while, in the return cases, 33.6 per cent, or about one-third, had that number of cavities. In the cases with from four to eight cavities, 31 per cent of the new cases were in this group, whereas 29 per cent of return cases were in this category. In the over eight group, 29.6 per cent of new cases had that number of cavities, while only 11 per cent of the return cases were found to have eight or more cavities. Is this perhaps just another proof of our assertion that regular follow-up of dental cases can control the number of cavities which develop, although it does not prevent them entirely? This cannot, of course, be positively stated from the study, which covered only one year, and more particularly since there is general agreement, on the basis of considerable research, that the actual cause of dental caries has not yet been determined.

In the completed cases, the average number of visits for all completed cases is slightly more than four visits per patient. All children made an average of 2.7 visits for completion, varying from 1.2 visits in the preschool group to 4 visits in the group from 13 to 16; while all the adults averaged 6.7 visits per patient. The refugees made an average of 7 visits per patient for completion, while the non-refugees made an average of 3.5 visits per patient. The dental condition was found to be far worse in refugees, and this, together with the fact that there were many more adults in the refugee group, most of them requiring treatment for gingivitis, undoubtedly explains this variance.

The average for extractions at the community health center during 1940 was one extraction for about every fifth patient. However, it is important to note that all extraction cases requiring nitrous oxide anesthesia are referred to the Jewish and Mt. Sinai hospitals since the community health center does not have the necessary equipment. Roentgenograms and dentures (some of the latter are only partial dentures) are made in Dr. Tassman's office. During 1940, there was a total of 145 referrals to hospitals for extraction under nitrous oxide anesthesia, 312 visits to Dr. Tassman's office for denture work and about ninety-five visits for roentgenograms, the total number of roentgenograms being 284. These

additional dental visits for service outside the community health center total 552, and if we assume that they were all made on completed cases and divide them among the 841 cases that were completed, there would still be an average of only a fraction of a visit more for each completed case, or 4.7 instead of 4 visits.

The number of carious teeth naturally affects the number of visits. The largest number of new children were in the group having from four to eight cavities, while the largest number of returning children were in the group with three cavities or less.

The patients who did not complete treatment in the 1940 group averaged 5.2 visits each, the uncompleted child cases averaged 4.4 visits and the uncompleted adult 5.9 visits each.

Gingivitis as a rule requires long-time treatment. We found that 6 per cent of the child group and 49 per cent of the adult group had gingivitis. We also found that many of the uncompleted adult cases were those being treated for gingivitis. This was particularly true of the group over 30 years of age, both refugees and non-refugees, and especially so in the new cases, where treatment frequently was extended over a very long time.

From our study, we may conclude that we are giving a service to both children and adults which is having satisfactory results, both in terms of completed cases and in terms of the number of visits. With our method of follow-up, which insures the return of a large number of patients while still in contact with the referring social agency, we are controlling, to some extent, the amount of new caries and the spread of conditions of the gums. Whether health education is responsible, it is difficult to say, but the returns for follow-up seem to us most gratifying. We do not wish, however, to give the impression that we are content with the results obtained according to our study, for we feel that there is still considerable room for improvement in the matter of attendance and completion of cases. If it were possible to have appointments at shorter intervals in those cases requiring a number of dental visits (the average for return appointments during 1940 was about three weeks), the appointments, we are inclined to believe, might be kept in a greater number of cases, which should, in turn, increase the number of completed cases.

This raises the question whether it is wiser to concentrate treatment on a smaller group, making appointments at intervals of one week until the case has been completed, and then go on to a new group; or whether the present method of spreading the service in order that many more persons may be included is more desirable. Naturally, the answer to the problem is increased equipment and staff. This would afford more clinics and increased service, which should have the desired result of a greater number of completed cases.

SUMMARY

The study showed that 62 per cent of patients were children and 38 per cent adults; that 12 per cent of new patients had three cavities or less, while 33.6 per cent of returning patients had that number of cavities; 31 per cent of the new and 29 per cent of returning patients had from four to eight cavities, and more than 29 per cent of the new and only 11 per cent of the return had more than eight cavities. In the children's group (all ages up to and including 16 years), 26 per cent were in the negative classification. Among the new cases, the greatest number of negative cases were in children under 6 years; while, in the returning cases, the greatest number of negative cases were in the over 6 year group. The average number of visits per patient for completion was slightly more than four, but, in separating children from adults, we found that the average

number of visits for completion of child cases was 2.7, and for completion of adult cases, 6.7. We learned that 69 per cent of children and 38 per cent of adults continued to completion of their cases. The long treatment for gingivitis in the adult group was undoubtedly a factor in the number completed in the adult group. The dental condition of refugees was found to be far worse than that of the non-refugee group.

330 South Ninth Street.

THE CHOICE OF ORTHODONTIC APPLIANCES

By GEORGE S. CALLAWAY, D.D.S., New York, N. Y.

THE choice of orthodontic appliances for the prevention or correction of malocclusion is based on (1) the age of the patient; (2) the treatment as indicated by a careful diagnosis; (3) the skill or training of the operator; (4) the school of thought which the operator follows, and (5) the ability of the patient to pay for a service that is rendered.

I am touching but lightly on the treatment of the child before the complete eruption of the deciduous teeth. Mouths have been ruined by the extraction of deciduous teeth which were erupted at birth. The time of operation for the correction of cleft-palate and harelip has a great influence on later measures for correction of dental anomalies; and, if given an opportunity to express an opinion, the dentist should be prepared and ready to do so. The prevailing thought today is that harelip should be surgically corrected as soon as possible, with care to prevent the formation of a tight and unelastic band of cicatrical tissue, which would interfere with maxillary development. The surgical correction of cleft-palate can be postponed until the age of about 2 years, when speech habits are being formed, and can be better postponed until 4 or 5 years of age.

Many cases of malocclusion can be avoided by the use of such simple appliances as tongue depressors and rubber bite straps, and by habit and posture correction and myofunctional therapy. Although not strictly classed as orthodontic appliances, the muscles, including those used in breathing, can cause tooth movement and, if used in a corrective way, can be considered as the appliance of choice.

Alfred P. Rogers has often made the statement that one of the first steps in orthodontic treatment is to eliminate interference. My understanding is that Dr. Rogers means any interference with normal dental development. It might be muscular or cuspal, such as a narrowing in the cuspid region. The remedy is obvious: to widen the cuspid or other area to allow normal mandibular relations; or, in even more primary cases, to judiciously grind an interfering cusp of a deciduous tooth to allow normal functioning and development. Interference with growth and development could be extended to include thumb or tongue habits or overdevelopment of the mentalis muscle.

In a developing malocclusion where one, two, three or even six anterior max-

Read before the Section on Orthodontia at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 30, 1941.

illary teeth are locked in lingual occlusion, a simple lower retaining plate built with an inclined plane over the lower incisors and cuspids will be found both inexpensive and effective in maxillary incisal development to start growth in the proper direction. The use of this appliance, however, is based on a diagnosis that the maxillary incisors are retracted and that the mandible is not protruded.

The choice of an appliance is founded on what one considers correct diagnosis of the abnormality to be treated. The simple act of taking impressions and making a set of occluded plaster models for laboratory diagnosis is a thing of the past, or should be. The dentist or orthodontist can assume professional status only when he makes the diagnosis and devises the method and determines the means of treatment.

An apparently simple so-called Angle Class II or Class III case might be based on an incorrect diagnosis that while the maxilla was normal, the mandible was in abnormal relationship with it. Treatment would depend on whether the maxillary teeth or mandibular teeth were in an abnormal cranial position. To determine where the abnormality lies, cranial x-ray pictures or gnathostatic diagnosis would have to be employed. I try to be very cautious in the use of such terms as always, ever, never, and must. I have tried to be careful in my use of the terms "growth" and "development." Growth is an increase in size, in contradistinction to development, which is an increase or improvement in function. A careless use of these terms has led to their being regarded as almost synonymous. Simple lingual arches promote growth in the deciduous dentition. The lingual arch, in aiding growth, can eliminate interference with normal development by increasing the movement of the interfering teeth or cusps to positions of advantage. Auxiliary springs of light force, in conjunction with the lingual or labial arch, are the appliances of choice in simple malocclusion cases, whether in the deciduous or in the permanent dentition. Many cases have been and will continue to be successfully corrected by their use.

Lingual arches can be a great aid in preventing the forward migration of molars in an arch where the anterior teeth are already crowded and the molars might slip forward during the period coincident with the loss of the deciduous molars. The most difficult problem today is to correct, by distal movement, the molars which, because of forward pressure or lack of restraining anterior force, have pushed the lateral segments of each jaw into positions anterior to normal.

Within the last five years, great strides have been made in the correction of malocclusion. Many changes of thought have taken place and the pendulum seems to be swinging back to mechanics. Studies of child growth and the many physiologic factors involved have been an aid in treatment, but the trend toward speed, the shortening of the period of treatment and the desire for better permanent results, which are necessary if we are to aid those requiring orthodontic help, have directed our thought to what might be termed an "up and at 'em" trend which will put the teeth back in their proper position in the bony structures which support them.

This is based on a very logical theory and, to date, has proved itself by the practical and actual results presented by Charles H. Tweed in exhibits before this association and by Spencer R. Atkinson.

These trends in mechanical treatment have not left out of consideration the many basic factors in the primary causes of malocclusion, but rather have emphasized the important part they play in maintaining any desirable results. They have, however, led to a more definite requirement of specialization and refinement of technic in construction and manipulation and a better understanding

of the principles involved or of the mechanics of the appliance used.

It would be useless and a waste of time to try to convince any one who has already made up his mind that any one appliance or school of training is inferior to another. This personal factor would determine the choice of the appliance to be used in treatment. In refusing to have my mind made up by other people, I am only human. In adopting what I think is best for the correction of the case in question, I am using horse sense.

It is safe to say that there has never been an appliance yet devised which did not have some useful purpose and which would not, in many instances, be the simplest and best that could be used for a particular purpose. Many of us are inclined to say that because a man does not use a lingual arch with auxiliary springs and secure tooth movement with slight gentle pressure, he is not practicing orthodontia; losing sight of the fact that another man using the type of appliance requiring the banding of many more teeth can employ much finer gage wires with gentler force and more definite control.

The more complicated the case, with the necessity of many and variegated tooth movements, requiring careful thought as to problems of anchorage, the greater the opportunity to use the multiband type of apparatus. In this type of appliance, I group the edgewise arch, the modified edgewise (Sved), the McCoy and Howe open tube and the twin wire appliances. Each of these appliances has some advantages over the others, but the continued use of one type of apparatus makes one more expert in its use and adaptability.

The trend in appliance materials at the present seems to be toward chrome alloy. A more definite and refined soldering technic will lead to the possible complete elimination of precious metals.

In the economic situation as it is today, somebody, either privately or through taxes, has to pay for the professional services rendered to any patient. Therefore, to be able to offer our services to as many patients as possible, it behooves us to simplify our appliance therapy to a point where the simplest type can be used for those cases requiring slight adjustments, with due thought to the fact that our choice of appliance should be made basically upon our understanding of its principles, in order that we may render our best service to the patient with the least possible chance of injury.

654 Madison Avenue.

TREATMENT OF ALIMENTARY STREPTOCOCCICOSIS, WITH SPECIAL REFERENCE TO THE ARREST OF DENTAL CARIES

By P. H. Belding, D.D.S., and L. J. Belding, M.D., M.P.H., Waucoma, Iowa

THE initial lesion of dental caries is essentially a symptom of a general disease rather than of a disease entity *per se*.[1] The basic disease is due to the conversion of the harmless *Streptococcus salivarius* (Fig. 1) to the high acid-producing mucoid phase. (Fig. 2.) The production of mucoid colonies by

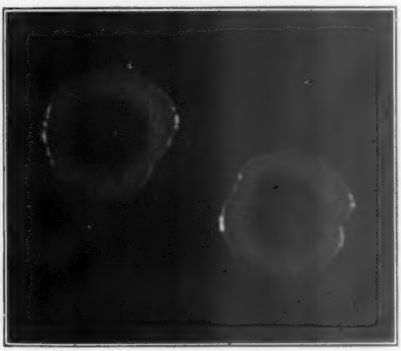

Fig. 1.—Colonial forms of Str. salivarius derived from saliva of breast-fed baby. (Photograph taken with transmitted light.)

Str. salivarius has been described by Niven, Smiley and Sherman.[2] This shift may also alter the basal flora of the entire digestive tract and contribute to the etiology of certain types of arthritis.[3, 4, 5]

After this shift has occurred, the caries-producing factors become activated, and the changed oral environmental conditions favor the growth of many types of acid-producing organisms, all of which undoubtedly contribute to the destruction of the teeth.

From clinical experience, we have found that if a diet is administered which permits the mucoid phase of *Str. salivarius* to revert to the primitive level, the other acid-producing organisms associated with dental caries tend to disappear from the oral flora and the caries process is arrested.

The following dietary régime will usually inactivate the carious factor in the average case of hypersusceptibility:

A twenty-four hours' fast.

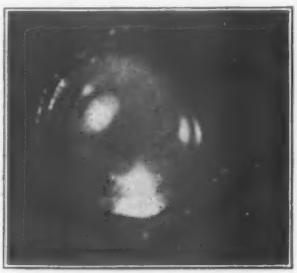

Fig. 2.—Colonial forms of Str. salivarius (Str. odontolyticus) derived from saliva of caries-susceptible individual. (Photograph taken with reflected light.)

A forty-eight hours' period during which cultured milk, preferably acidophilus, is consumed daily (2 to 3 quarts).

One week of an essentially protein diet, consisting of the following foods: beef, butter, cream, cheese, mutton, pork, fish, poultry, eggs, seafood and shellfish. In addition, 1 quart of cultured milk should be consumed per day.

At the conclusion of the protein period, the following foods may be added to the diet: tomatoes, wheat germ, carrots, peas, string beans, rutabagas, radishes, onions, cabbage, lettuce, sauerkraut and cornstarch.

All foods not mentioned are strictly forbidden, for such insignificant things as chewing gum or the eating of mints will often defeat the purpose of the diet.

After three weeks, the caries-producing factor usually disappears, and the patient may return to a normal dietary. However, soft breads, pastries, etc., should be consumed in limited amounts, while the total intake of sugar (sucrose) should be limited to 2 tablespoonfuls for the average adult in a twenty-four-hour period. Foods, such as honey and corn syrup, containing the simple sugars are apparently satisfactory sources of sweets.

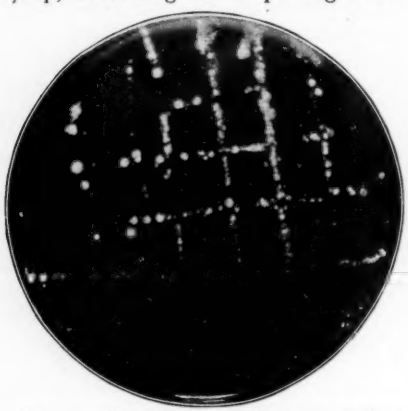

Fig. 3.—Colonial formations as derived from whole saliva of caries-immune individual; showing complete absence of mucoids. (Photograph taken with reflected light.)

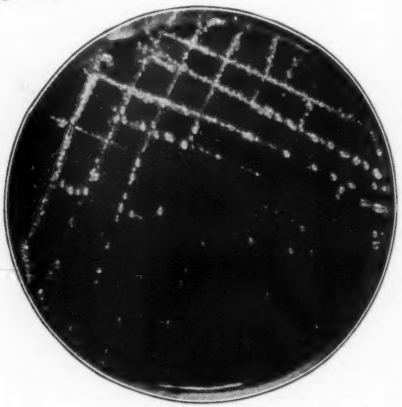

Fig. 4.—Colonial formation derived from whole saliva in case of caries hypersusceptibility. After a three weeks' period of dietary control, the colonial formation was identical to that shown in Figure 3.

DETERMINATION OF CARIES SUSCEPTIBILITY

1. *Preparation of Medium.*—Thirty-one grams of bactonutrient agar, 1.5 per cent, and 20 gm. of sucrose are placed in a flask containing 1,000 cc. of cold distilled water. This is autoclaved for twenty minutes at 15 pounds. After it has cooled sufficiently to be handled with ease, 50 cc. of fresh human blood is added, and the combination is mixed thoroughly. The medium is now poured into Petri dishes and allowed to cool.

2. *Test for Caries Susceptibility.*—Saliva is streaked on the plates and incubated from forty-eight to seventy-two hours. If the saliva is from an immune individual, the plate will appear as shown in Figure 3. If the saliva is from a hypersusceptible individual, the plate may appear as shown in Figure 4. It should be understood that in less severe cases, there will be fewer mucoid colonies and a greater number of colonies produced by the normal oral flora.

There are other satisfactory tests for caries susceptibility. The foregoing test has been given on account of its simplicity.

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REMOVAL OF TWENTY-ONE UNERUPTED TEETH FROM ONE PATIENT: REPORT OF CASE

By C. M. Logsdon, D.D.S., Hines, Ill.

History.—A white man, aged 48, who was born in Austria and served in the U. S. Army during the First World War, was admitted to Hines Hospital July 22, 1941, with a diagnosis of failure of seven upper teeth to erupt and purulent drainage from and abnormality of the upper arch. He was well developed and well nourished. He had no complaints other than the oral conditions and routine examination by the admitting personnel was essentially negative otherwise.

Examination.—Oral examination revealed two erupted teeth on the right side of the upper arch in position, the first bicuspid and the third molar. There was a fistula, with drainage from the buccal area of the right upper second bicuspid region. There was excessive soft tissue on both sides of the palate and a deep anteroposterior fissure extending the length of the palate. However, there was no opening through the palate. Roentgenograms of the upper arch revealed five unerupted teeth on the right side and two unerupted teeth on the left side. (Fig. 1.)

In the lower arch, five erupted teeth were visible, the left second molar, second bicuspid and lateral incisor and right second bicuspid and second molar. A bridge extended from the left to the right second bicuspid. Roentgenograms of the mandible revealed embedded lower third molars and a mass of unerupted teeth in the bone from the left to the right bicuspid region, the exact number not being determined, since they were so closely bunched.

Operations and Treatment.—Under block anesthesia with surgical cleanliness, the seven erupted and twenty-one unerupted teeth were removed, on the following dates: July 28, the upper right erupted first bicuspid and third molar and unerupted teeth in the positions of the upper right central and lateral incisors, cuspid, second bicuspid and first molar: August 6, unerupted teeth in areas of the upper left lateral incisor and second molar; August 19, the erupted lower left lateral incisor and second bicuspid and six unerupted teeth between the symphysis of the mandible and in the area of left second bicuspid; September 8, the erupted lower right second bicuspid and six unerupted teeth in the region from the symphysis of the mandible and right second bicuspid; October 6, the erupted lower left second molar and unerupted lower left third molar; October 17, the erupted lower right second molar and unerupted third molar. (Fig. 2.)

These teeth were removed intra-orally. As the roentgenograms revealed, the teeth were covered with bone. The bone was properly prepared and the soft tissue was trimmed and sutured in position following removal of the teeth. After removal of the unerupted teeth, the cavity was medicated by placing 7½ grains of sulfathiazole in the wound and placing the medicament, a gauze dressing immersed in sulfathiazole ointment. Cold compresses were applied to the face, being left on one hour and off half an hour for ten hours following operation. Codeine, one-half grain, was administered as required for twenty-four hours after operation. Thereafter, pyramidon in 5 grain doses was administered as needed for a week or so. The gauze dressings were removed after forty-eight hours. The wound was irrigated with a saturated solution of sulfathiazole and a similar dressing was inserted daily thereafter for ten days. However, the gauze dressing immersed in sulfathiazole ointment was

From the Dental Clinic, Oral Surgery Section, Veterans Administration.

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made a little smaller each time the dressing was changed.

September 23, a piece of excess tissue about 4 cm. in length and 1 cm. in diameter was excised from each side of the palate, November 3, under local anesthesia. To protect the wound and to promote coagulation, a sterile gauze immersed in Monsel's solution was placed over the wound and sutured there for two days. Cold compresses were applied to the face region for ten hours and one-half grain of codeine was administered to relieve pain on two occasions within twenty-four hours after these two operations. The patient was placed on a well balanced liquid and semisolid diet during the treatment period.

Outcome.—He was discharged November 7 with maximum benefits. Drainage of the fistula had ceased, the wounds of the mouth region had healed and there was no pain or discomfort in the mouth region.

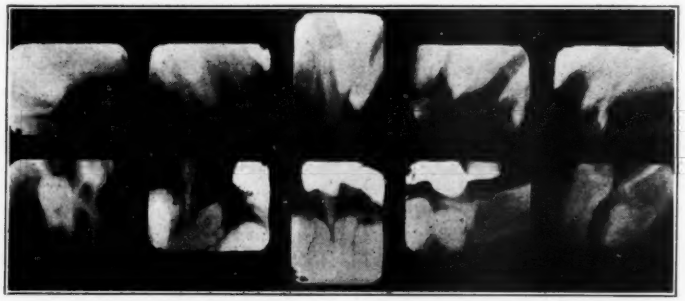

Fig. 1.—Twenty-one unerupted teeth in one patient.

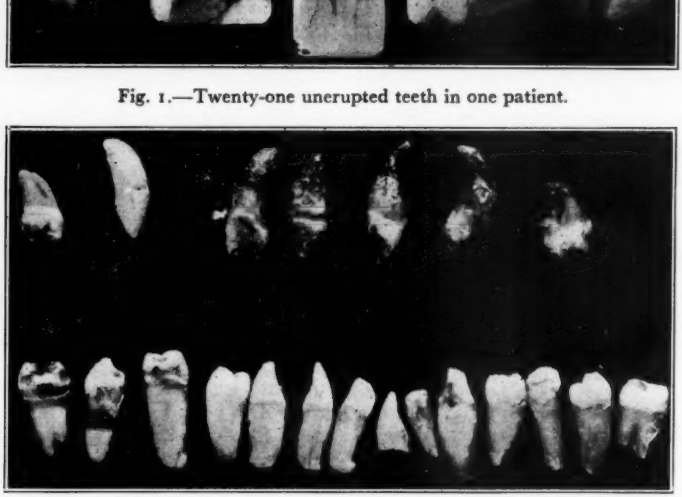

Fig. 2.—Twenty-one unerupted teeth, after removal. There were seven in the upper arch and fourteen in the lower.

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AUGUST 1 *Editorial Department* 1942

FEDERAL LOANS TO DENTAL STUDENTS

AT the time of the adoption of measures to draft into the United States Army Service all able-bodied men between the ages of 21 to 37, it was recognized by the Government and the professions that provision would have to be made for considerable increase in the product of the medical, dental and veterinary schools, to provide for sufficient service of the medical groups for the army and for the civilian and the industrial population. The extension in age range within the past few months has drawn renewed attention to the increasing need for medical services in the Army and in the industries and in civilian life.

This need of enlarged service has been felt intensively in nearly all of the technical and professional fields. In consequence thereof the National Committee on Education and Defense and the United States Office of Education called a conference of college and university presidents in Baltimore in January 1942, to consider ways and means of increasing the professional educational output to meet the new requirements. Accordingly, in a praiseworthy spirit of helpfulness to the Government in its present war emergency, the conference advocated the establishment of accelerated programs of study in various technical and

professional fields through which a greater number might be prepared, and in a shorter length of time, to meet the emergency.

Conscious of the added financial burden imposed by such a program, not only upon the colleges and schools, but also upon the student body, the conference recorded itself as favoring provision of funds by the Federal Government for aid to both institutions and students participating in the accelerated programs.

A study of the situation was made by the United States Office of Education under the direction of the War Manpower Commission with a view to federal provision of funds for the program, and accordingly a bill has just been passed by Congress providing five million dollars for loans to students—medicine (including veterinary), dentistry, pharmacy, engineering, physics and chemistry.

In the preliminary study of the situation, the Council on Dental Education of the American Dental Association, in considering the purely dental aspect of the problem, found that 72 per cent of all dental students enrolled considerably augment their resources by employment during their spare hours and that dental students earn in this manner an average of $343 per year. It was also found that about 75 per cent of the student's income was earned during the summer vacation months.

In an accelerated educational program such as was proposed, to graduate the student in three years rather than four would necessitate continuous attendance in his dental course and consequently deprive him of the time and opportunity to earn additional income. It was conservatively estimated that dental students throughout the United States earn over two million dollars annually. These facts were presented to the United States Office of Education and to the War Manpower Commission by the Council on Dental Education as the basis for dentistry's claim that it should be included in any provision made by the Government for aid to institutions and to students.

In the legislation providing the above-mentioned funds, the administrative authorities have again expressed their estimation of dentistry's importance as a health service and have made full and, we believe, ample provision for aid through loans to dental students that will enable them to complete their course and equip themselves for health service to the various branches of governmental war activities.

The provisions for the loans are liberal indeed, particularly those for repayment of the loan and the interest. Assistance will be given to students in such numbers as the chairman of the War Manpower Com-

mission shall determine, to participate in accelerated programs in degree-granting colleges and universities in engineering, physics, chemistry, medicine (including veterinary), dentistry and pharmacy, in which a technical or professional education can be completed within two years.

A scholarship restriction is properly imposed whereby loans shall be made only to students who attain and maintain satisfactory standards of scholarship. Loans will be confined to those who are in need of assistance, who agree to participate in the accelerated programs of study and who agree to engage, for the duration of the wars in which the United States is now engaged, in such employment or service as may be assigned by officers or agencies designated by the chairman of the War Manpower Commission. The loans are to be made through the participating colleges or universities from funds paid to them out of the federal appropriation. Loans will be made in amounts not exceeding a total of $500 to any one student during any twelve-month period.

Another provision of the bill, and an exceedingly generous one, is that indebtedness of students who, before completing their courses, are ordered into military service during the present wars under the Selective Training and Service Act of 1940, or who suffer total and permanent disability or death, will be cancelled.

We submit that this bill with its generous provisions marks another noteworthy expression of recognition of the dental profession on the part of the administrative authorities as an important and indispensable public health service.

ANESTHESIA AND DENTISTRY

WE have just been informed that the International Anesthesia Research Society has in contemplation for adoption at its next annual meeting a change in its constitution and by-laws relating to membership which would practically disfranchise all its dental members.

The change in question establishes three classes of members: active voting members, associate members and honorary members. Active voting members are to be licensed physicians, paying $12 a year. Associate members are to be dentists without voting privileges and paying $10 a year.

Ordinarily, we should readily defer to the wishes of any organization in the selection and classification of its membership, but, in the present

instance, the invidious discrimination, as it were, appeals to us as unfair and unjust. No reason is advanced for the proposed disfranchisement of the dental members, but we assume that those who propose this revision must have reasons for doing so, since it is stated in the instructions in the referendum vote sent out that at the Twentieth Annual Congress of Anesthetists each article and paragraph were considered carefully, discussed separately, voted upon and passed. The only reason suggested for the changes in the constitution and by-laws was a desire to safeguard "the value and importance of the members' investment in the International Anesthesia Research Society." We note, however, one concession offered to dental members and that is a reduction in dues to $10, whereas the voting members are to pay $12, which appears to us as another evidence of unjust discrimination, in consideration of the withdrawal of voting privileges.

The apparent reason, which to us is no reason at all for discrimination against the dental members, is that they are dentists and not physicians.

Shades of Wells, Morton, Jackson *et al.!* Imagine the dental profession being excluded from anesthesia councils, the profession which gave to humanity and to the medical profession the discoverer of anesthesia, which developed the process to perfection and which practically forced the medical profession to use it!

From the time of the discovery of anesthesia, the dentist has been closely identified with the procedure both in knowledge and in practice. He has, since Wells' discovery, administered nitrous oxide in virtually millions of cases, and, since the higher development of the surgical procedures in dentistry, he has familiarized himself with the anesthesia phenomena produced with various agents. In his field, he is, we believe, as well qualified to administer the several forms of anesthetics as is the physician.

No! We do not believe the sheep and goat classification, as it were, should be applied in this instance any more than in the numerous other instances wherein the physician has arrogated to himself superior knowledge in health service.

There are, however, many reasons why such discrimination should not be made against the dentist, and among them we note the following:

1. The American Medical Association in 1870 voted recognition of Horace Wells, a dentist, as the discoverer of anesthesia.

2. William T. G. Morton, a dentist, first demonstrated ether anes-

thesia, and was the first specialist in anesthesia, his claims to the discovery of the anesthetic properties of ether being recognized by the Congress of the United States.

3. Carlson, a dentist, introduced ethyl chloride as an anesthetic.

4. Teter and Heidbrink, dentists, were early manufacturers of nitrous oxide anesthesia apparatus and did much educational and scientific research work in promoting nitrous oxide anesthesia.

5. Local anesthesia was popularized in this country through the interest and efforts of the dental profession.

6. At all meetings of the International Anesthesia Research Society, the dental section has a larger attendance than that of any other section.

7. The dental profession is preparing for a fitting celebration in 1944, under the sponsorship of the American Dental Association, of the discovery of anesthesia by Horace Wells.

We sincerely trust that the directors and governors of the International Anesthesia Research Society will reconsider its proposal for a change in character of membership to the extent, at least, that dentists shall enjoy the full privileges of the society, to which they are on all counts entitled.

ANNALS OF DENTISTRY

WE are pleased to note the revival of the *Annals of Dentistry* under the editorship of Dr. Lester R. Cahn.

A copy, designated Vol. 1, No. 1, New Series, has just been received in revised and revamped form and it is hoped that this creditable journal, published by the New York Academy of Dentistry, may have a long and successful career in the dental literary world.

Dr. Arthur H. Merritt and Dr. Joseph L. T. Appleton are associate editors, and it is predicted that these two able assistants to the new editor will bring new life and inspiration to the revived *Annals*.

CORRECTION

In THE JOURNAL for July 1, page 1219, the address of H. B. McCauley was given as Rochester, Minn. Dr. McCauley is at the Rochester University School of Medicine and Dentistry, Rochester, N. Y.

BIBLIOGRAPHICAL

Communicable Disease Nursing

By THERESA I. LYNCH, R. N., Ed. D., Instructor in Education, New York University; Formerly Superintendent of Nurses, the Willard Parker Hospital, New York City. Cloth. 678 pages with 161 illustrations. St. Louis: The C. V. Mosby Company; 1942.

THIS volume presents a complete account of the methods of controlling and treating infectious diseases from the nursing point of view. To this end, a detailed and illustrated presentation is given of the methods of aseptic technic useful in the nursing care of patients suffering from communicable diseases. Separate chapters are provided for covering each of the communicable diseases and, in general, each section contains sufficient information regarding the disease under discussion to assure that the nursing care will be assumed in a more intelligent manner. The book can be heartily recommended as a suitable textbook for nurses studying the treatment of contagious diseases. FRANK F. KANTHAK.

Medical Applications of the Short Wave Current

By WILLIAM BIERMAN, M.D., attending physical therapist, Mt. Sinai Hospital, New York City; assistant clinical professor of therapeutics, New York University College of Medicine. Ed. 2. Cloth; 344 pages; 87 figures. Baltimore: Williams & Wilkins Co., 1942.

THE generation of short wave currents and the selection of suitable equipment for this purpose are discussed briefly. The ability to produce heat in parts of the body otherwise inacessible is a unique feature of the short wave currents.

Bierman gives in detail the technic for inducing short wave currents in the different body areas and evaluates critically their therapeutic effectiveness in various disease processes. The dangers of short wave currents when used by those without adequate training are emphasized.

There is a complete discussion of the application of short wave currents in dental practice. Gutzheit and Kuchlin's short wave diagnostic test for oral foci of infection is of particular interest. They state that when oral foci are responsible for systemic manifestations, the sedimentation rate is noticeably accelerated after provocative irradiation of the oral focus. The reliability of this test is questioned.

The treatment of apical granuloma, pericoronal infection, periodontitis and acute periostitis of dental origin by short wave currents is also discussed. Pain along the distribution of the fifth nerve, as well as peripheral facial paralysis, may be favorably influenced. While it is essential that all metals be removed from the treated area, metallic dental fillings do not seem to cause any difficulties.

Short wave currents are discussed as an adjunct in the treatment of Vincent's infection, "dry socket" and postextraction pain. The author's observations on temperature changes in the sockets of recently extracted teeth indicate no appreciable elevation of temperature after the application of short wave currents. Aside from this original contribution, the section on dental applications consists essentially of a review of the reported uses of short waves in dental practice. Bierman summarizes the dental applications of this form of physiotherapy thus: "In view of the fact that much skillful technique has been developed in the treatment of dental conditions, it is possible that the short wave current may never come to assume a place more important than that of an auxiliary measure."

This well printed and well bound volume is a complete and authoritative text on the therapeutic uses of the short wave current. Those interested in this form of physiotherapy will appreciate particularly the extensive bibliography.

L. W. B.

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President's Message

POSTWAR PLANNING

IT is common knowledge that postwar planning is being carried on by both government and industry. To uninformed persons, such planning may appear to be somewhat beside the point, and a bit on the visionary side. However, to practical persons who face issues squarely, such planning is absolutely essential in any consideration of the future of government, industry or any professional group. It is essential because it is well known that the present world conflict is likely to bring to the social and economic aspects of American life as many as, if not more marked changes than, did the first world war. Furthermore, the nature of the changes can be predicted with reasonable accuracy, and the fact that such predictions can be made is one of the basic reasons why postwar planning is considered to be possible, practical and worthy of serious consideration on the part of any group.

While I do not make any attempt at this time to predict what changes will occur, I do think that it is well to raise a few questions that may indicate the magnitude of the problem or problems which dentistry is liable to face in the future.

What will be the effects of demobilization of the armed forces and the war industries? Will the transition from war to peace create unemployment or underemployment to a degree that will require the establishment or the extension of federal public works programs, unemployment insurance and other devices considered to be necessary to the welfare of our people? It appears to be clear that unless an era of tremendous prosperity immediately follows the war, such artificial stimulants to employment will be as necessary as they were in the recent economic depression.

With the already existing trends in the matter of government participation in the fields of health service, it is pertinent to ask, will these trends be accelerated by war, and by the problems of the postwar period? Will some form of sickness insurance come into existence? Or will there be a great expansion of already existing public health activities? Here, it should be kept in mind that the whole question of health in its preventive and therapeutic aspects has many ramifications, extending into fields which have to do with food, shelter and education, and many others.

Will there be in the postwar period an expansion of social security benefits? In the face of a population which is becoming top heavy with middle-aged and elderly people, and also in the face of unemployment, insecurity and many like conditions, is it not probable that the Federal Government and the states working together will materially extend their social security programs?

Will we have a more carefully planned economy in the United States after the end of the present world conflict than we have ever had before? What will this mean in terms of taxation, of income, and what effects will such a planned economy have on the dental practitioner and on the profession as a whole?

What will be the combined effects of the findings of research and of the zeal for improved national health upon the content and practice of dentistry? Here, it might be reasonable to predict that much of the knowledge and many of the technics in dentistry will rapidly become obsolete and will be replaced by new knowledge, from which will spring new modes of practice. The pressure of new knowledge and the desire for increased national health will alter considerably the philosophy of dentistry as well as its content.

Will there be federal subsidization of general and professional education? Will the enrollment in dental schools drop to a low point, or will it increase? In either case, serious problems will be encountered.

The foregoing questions represent but a few of those that might be raised in regard to the period of reconstruction and readjustment. In many cases, single questions appear to be isolated and apparently of little importance in themselves. However, all of the problems of the postwar period and all of the questions that one may raise regarding the problems of that period are bound to be interrelated. It is, therefore, necessary that we see each problem and each question in its relation to the whole postwar social and economic structure. Certainly, one can say that it is no longer possible for dentistry to be isolated when it comes to the matter of solving such problems as we are liable to face in the near future. Dentistry cannot be isolated from the problems of unemployment, farm production, old age security, education and the like, for every change in our social and economic structure will affect the dental profession as well as the consumers of dental services. It is therefore essential that the organized dental profession begin as soon as possible to build a postwar platform. This should be done despite the fact that the war is still going on, and also despite the fact that we must make every possible contribution to the success of the armed forces of the United Nations.

Postwar planning in dentistry is absolutely imperative, and the organized dental profession might do well to establish a postwar planning board of some kind, at the same time making possible the utilization of the services of experts in the various social and economic fields which touch the problems of the dental profession. Again, it appears to be a matter of foresight, which organized dentistry owes not only to the public, but also to every member of the dental profession.

Orrin a. Oliver

American Dental Association

MEETING OF THE HOUSE OF DELEGATES

AUGUST 24 to 26

ST. LOUIS, MO.

★

AFTER due consideration of the difficulties of transportation involved in holding the Annual Meeting, the Board of Trustees voted to cancel the regular Eighty-Fourth Annual Meeting of the American Dental Association, scheduled for Boston, August 24 to 28.

In lieu of this meeting and in order to carry on the essential activities of the Association, it was decided to hold a meeting of the House of Delegates, Board of Trustees and Committees in St. Louis, Mo., August 24 to 26.

The opening session of the House of Delegates will convene at 10:00 a.m., Monday, August 24. The second session will be held at 2:00 p.m., Monday, August 24; the third session at 2:00 p.m., Tuesday, August 25, and the fourth session at 2:00 p.m., Wednesday, August 26.

The four sessions of the House of Delegates will be held in the Ballroom of the Hotel Statler. The Credentials Committee will register Delegates and Alternates beginning 10:00 a.m., Sunday, August 23, at the Hotel Statler.

HOTEL STATLER IS AIR CONDITIONED THROUGHOUT.

Make your reservations direct with the hotel.

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PREPAREDNESS COMMITTEE

WAR MANPOWER COMMISSION

PAUL V. MCNUTT, War Manpower Commission Chairman, announced that the loan fund of $5,000,000 voted by Congress to help college students speed up their training for technical and professional service will be available soon.

Monthly loans totaling not more than $500 a year, at 2.5 per cent interest annually, which will be cancelled if the student is drafted during training, will be made directly to students by colleges or universities, and by public or college-connected agencies, Mr. McNutt said. Federal funds will be allocated to the lending institutions by the U. S. Office of Education on submission of estimates of the amount of money needed for such loans.

Bulletins announcing the program are being sent to all colleges and universities in the United States by the Office of Education.

This financial assistance will permit students to pursue intensive programs of study which will prepare them as soon as possible to meet the growing need for technicians. Loans will be made to students of engineering, physics, chemistry, medicine, dentistry, pharmacy and veterinary medicine who are within two years of completing their work. The program is an outgrowth of recommendations by the office of Education Wartime Commission, which conducted studies of the need of accelerated programs in colleges.

Plans for administration of the student loan fund are being developed by Fred J. Kelly, chief, Division of Higher Education, Office of Education. They will be submitted by John W. Studebaker, U. S. Commission of Education, to Mr. McNutt for approval.

Essential points of the student war loan program as developed by Commissioner Studebaker are:

WHERE TO APPLY.—Loans are made to students directly by colleges or universities or public or college-connected agencies. Federal funds are paid the colleges upon estimates submitted as to the amounts necessary for the loan.

SPECIAL CONDITIONS.—Loans are available only to students who are registered in accelerated programs in degree-granting colleges and universities and whose technical or professional education can be completed within two years, in one of the following fields:

Fields of work: Engineering, physics, chemistry, medicine (including veterinary), dentistry and pharmacy.

Written agreement: The student agrees in writing (1) to participate, until otherwise directed by the chairman of the War Manpower Commission, in accelerated programs of study in any of the authorized fields; and (2) to engage for the duration of the wars in which the United States is now engaged, in such employment or service as may be assigned by officers or agencies designated by the chairman of the War Manpower Commission.

Scholarship: Students must attain and continue to maintain satisfactory standards of scholarship.

Need: Students must be in need of assistance.

Maximum loan: Loans shall be made in amounts not exceeding tuition and fees plus $25 per month, and not exceeding a total of $500 to any one student during any twelve-month period.

Security: Loans are to be evidenced by notes executed by student borrowers payable to the Treasurer of the United States.

Interest rate: The rate of interest is 2.5 per cent per annum.

Repayment: Repayments of loans are to be made through the colleges, universities or other agencies negotiating the loans, to be covered in the Treasury as miscellaneous receipts.

Cancellation: The indebtedness of a student shall be cancelled (1) if before completing his course, he is ordered into military service during the present wars under the Selective Training and Service Act of 1940, as amended; (2) if he suffers total and permanent disability, or (3) in case of death.

SELECTIVE SERVICE SYSTEM

DEFERMENT DENTAL INTERNS

THE Selective Service Headquarters believes that dental interns should receive the same consideration for deferment as medical interns; i. e., deferment for one year as men engaged in training for an essential profession.

Duly licensed physicians, dentists, and veterinarians who have volunteered for service and who cannot be used in their professional capacity and whose professional services are needed in the community, may be considered by the local boards for occupational deferment.

L. G. ROWNTREE
(Colonel, Med. Res.)
Chief, Medical Division.

MEDICAL SERVICE IN INDUSTRIAL AREAS

THE Subcommittee on Industrial Health and Medicine of the Health and Medical Committee met in the conference room of the Federal Security Agency, June 15-16. Marked for special attention on the agenda was the extreme difficulty in which the war industries are finding themselves with respect to obtaining and retaining personnel for their medical services. The subcommittee considered the definition of "an essential man" in government and private industrial hygiene services and was expected to make recommendations to the War Manpower Commission through the Procurement and Assignment Service at its meeting on June 22. Recommendations will also be forthcoming on the nutrition in industry program. Dr. Townsend presented the progress report of the Division of Industrial Hygiene, National Institute of Health. Surgeon General Parran and other members of the staff, together with Dr. A. P. McCormack, state health commissioner of Kentucky, also met the subcommittee to consider problems of medical care in critical war areas.

BUREAU OF PUBLIC RELATIONS

THE RÔLE OF THE TEACHER IN THE SCHOOL DENTAL PROGRAM

By S. S. LIFSON,* M.A., New York, N. Y.

LEADERS of education have stated that a person educated in health is one who (1) understands the basic facts concerning health and disease; (2) protects his own health and that of his dependents, and (3) works to improve the health of the community.[1]

Programs of health instruction and health service are carried on in the schools so that these objectives may be attained. At times, however, we become so engrossed in a particular health problem that we lose sight of our objectives and set out to do things for people that they should learn to do for themselves.

Providing dental examinations of children in school is a good example of this paternalistic attitude. When we consider that nine out of ten children have decayed teeth and that dental decay is a recurring problem, we see that dental examinations in school raise several questions:

1. Is it necessary "to employ a school dentist merely to find a few children whom he can tell not to visit their dentist this year"?[2]

2. Is the dental examination in school a better educational experience for the child and parent than that performed in the office of the family's private dentist?

3. Are we teaching parents that they should take a child to the dentist only when the school shows them that a carious condition exists?

4. Are we furthering an integrated health program when we set up in the school "self-sufficient machinery for dentistry with total disregard for the machinery being developed for the child in other phases of health"?[3]

5. Are the educational potentialities of the classroom being utilized to their fullest in the furtherance of dental health?

The dental profession has long recognized that education is a potent factor in attaining and maintaining dental health. In speaking of dental health as it relates to the schools, Morris says,

> Dentistry has its important part to play in each of these fields, but let's so develop our program that we can do our part of the job in the most effective way, properly integrating it with all other programs designed to promote normal growth and development; then dental needs will become associated in the minds of the public as something that is closely related to the child's needs, and not a separate entity.[3]

The American Association of School Administrators agrees with this expression by Morris. They state that:

> Organization of the curriculum to provide experiences and instruction for children which will help them to develop acceptable health practices, scientific and wholesome attitudes, and understanding of sound health principles constitutes the desirable program of health instruction in the schools.[4]

Developing this point further, Nyswander states:

> It is now out of keeping with sound educational theory in health education to over-

*Research assistant, Health Education Demonstration, Department of Health.

Read before the School Dentists and Hygienists Section, Eastern Dental Association of the American Association of Health, Physical Education and Recreation, Pittsburgh, Pa., May 1, 1942.

emphasize one program (such as dental) without regard to all other educational efforts providing for the child's welfare. The child cannot be helped to form sound attitudes toward assuming future responsibilities for his health through campaign methods of specialists. His teaching must be unified through one source of instruction—the teacher.[5]

With these emphases on unification through the teacher of all health supervision for the child and our own conviction that the school must not further the dependency of parents on the school dental examination before they seek dental treatment for their children, we believe the dental program should start in the school classroom and not in the school dental chair. Turner, in his Malden experience, has demonstrated that such a program is practicable.[6]

The dental program developed by the School Health Study in Astoria, N. Y., also exemplifies this approach to dental care. It was proposed that teachers carry the full responsibility for (1) informing all parents once each year that a child needs a dental examination; (2) conducting systematic contacts with the home until the child receives attention, and (3) recording on each child's health card the progress he has made during the term in obtaining treatment. The private dentists of the community, on the other hand, agreed to give a dental examination to any child coming to their offices accompanied by a parent.

The following steps were taken to get the program started: 1. The district health officer presented the program to the dentists on his medical advisory committee. 2. These dentists called a meeting of the practicing dentists in the Astoria-Long Island City health district and discussed the program. 3. After the cooperation of the community dentists was assured, the plan was presented to the district superintendent and then to the principals. 4. The letter to be sent to every parent was formulated by the study and submitted to representatives of the dental profession and school authorities for approval. This letter carried the signature of the principal of the school attended by the child.

How well the principals cooperated in this program is manifested by the fact that, within one month after the program started, the teachers had distributed nearly 7,000 dental care letters to the parents. These dental care letters were written in simple language and attempted to educate the parents to the dangers of neglected dental decay and stressed the importance of seeing a dentist. A few important dental health facts were given to show the parent why her child should be taken to a dentist for an examination and treatment if it was found necessary. Space on the reverse side of the letter was provided for the examining dentist to indicate the location of the decayed teeth and whether the child was under his care.

After a reasonable time had elapsed, from ten days to two weeks, the teachers started the follow-up program. This consisted of first asking each child for the letter that had been taken home to the parent. The replies from the dentist and the parent to this letter influenced the type of follow-up that the teacher undertook. To facilitate follow-up, three different types of letters were mimeographed and used by the teachers, the type depending upon the child's dental status.

The teachers kept accurate accounts of each child's progress toward dental correction. These reports permitted an estimate of the value of the procedures instituted, and clearly demonstrated to the teachers that their efforts brought substantial results.

In addition to following the routines as described, the teachers introduced a new emphasis in their teaching of dental health and each in her own way did much individual work with the children.

How well did we succeed in obtaining dental care for the children? Did the

dentists of the community cooperate? What about the children whose parents could not afford the services of a private dentist?

Two hundred and six teachers cooperated in this program. The data which they gathered on the progress of their children in getting dental care were tabulated. An analysis of the data shows that, by the end of the school year, all the children (6,436) who were enrolled in the eight experimental schools from kindergarten through eighth grade had received letters addressed to their parents urging that they be taken to a private dentist for examination and treatment.

By the end of the school year, 71 per cent of the children not only had been examined, but also had completed their treatment, were under treatment or did not need treatment. In addition, 17 per cent of the children were examined and found to need treatment, but had not succeeded in getting it. Only 12 per cent did not avail themselves of the opportunity to visit a private dentist for an examination.

The parents of the children who comprise the 29 per cent who failed to get dental treatment or to receive a dental examination indicated, by the nature of their replies to the letters from the teachers, that for 50 per cent of them financial considerations prevented them from complying with the school's request. The other 50 per cent (930) indicated that they did not believe the child's teeth needed care. They gave various answers, among them that baby teeth did not require dental care, the child's teeth were o.k., and a physician had told them that the child didn't need to see a dentist. None of these opinions, of course, had been confirmed by a dentist. It is important to note that nearly all of the failures to have the teeth examined concerned kindergarten and first-grade pupils. The reactions of these parents indicated to us a great need for education of parents of preschool children. Thus, even though not a school problem *per se,* this becomes a school problem when we think in terms of preventing the tooth decay which is universally prevalent in children of school age. School people must aid public health workers in educating parents as to the desirability of dental care for the preschool child.

Private dentists examined 68 per cent of the children who received dental examination. This figure of private dentist examinations shows the high degree to which the dentists of the community cooperated. Their cooperation is more than an evidence of good will: the time given to free examinations represents actual expenditures in dollars and cents in terms of hours of service rendered, maintenance of office and overhead expenses.

This investment by the private dentists brought good returns when we consider that 72 per cent of the children who received treatment obtained it from private dentists, and that these men were also responsible for 82 per cent of the cases completing treatment at the end of the school year.

The amount of free clinic service was not increased in this area. It was limited to one hospital clinic and two department of health school clinics. These clinics cared for an extremely limited group of children. A majority of the children who attended clinics did so outside the district, mainly across the river in Manhattan.

SUMMARY

Our experience in Astoria has convinced us that the place to start a program for dental health is in the classroom. The teachers, through their work, have confirmed our belief that they can assume responsibility for the educational aspects of the program.

The fact that 88 per cent of the children were examined is evidence of the support given by parents to the program.

This is further substantiated by the data showing that 76 per cent of the children who needed dental attention were placed under care. Continuing this program over a period of years should reduce to a minimum the number of parents who are ignorant of the importance of either dental examinations or dental care.

The number of children examined and treated by private dentists in their offices shows the high degree to which the dentists of the community cooperated. This cooperation confirms a second belief; namely, that increased dental service for children results when the parents of school children and the private dental practitioners are brought together.

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ADMINISTRATION OF PUBLIC DENTAL HEALTH NOT SOCIALIZED DENTAL SERVICE

By C. CARROLL SMITH,* D.D.S.

DENTAL decay is a luxury disease. You may have it and put up with it and suffer the consequences, or you may be relieved of it and prevent its repetition and be comfortable, healthy and useful.

Increased efficiency in public dental health service has been occupying the attention of welfare workers the world over for many years. Dentists are not alone in recognizing the great need of the public for surcease from dental ills. Humanitarian workers and leaders in charities have been ambitious in their efforts to establish dental health service for federal, state and municipal interests.

Americans for America and America for the world must be maintained through a race of people physically fit, mentally alert and spiritually supreme. The highest degree of citizenship includes a patriotism aspiring to preserve a national vigor which will show to the world that token of excellence which must be naturally expressed in fitness of body, mind and spirit.

It was President Wilson who said, "The real thing we have to consider in America is the American people, their energy, their elasticity, their originative power, their capacity to hope and to achieve." We are living in an age in which most of the agencies striving to lift humanity out of its unfitness, its insufficiency, its lack of normalcy and its incapacity are taking into their activities the consideration of dental health as a matter of great concern in the welfare of the individual as a unit of the public good.

Discovery and correction of dental and other defects are recognized as essentials in humanitarian procedure. Oral health cannot be separated from the general processes which unite to keep the body in order. It is being conceded more and more that a beginning must be made in

*Director of Dental Department, Peoria (Illinois) Public Schools.

connection with conditions in the mouth, the doorway of the body, in diagnosing and treating any conditions of ill health. The time was when the mouth had no consideration as a factor in cause and cure of disease. It was an unacknowledged part of the human body in connection with sickness and physical discrepancies.

Groping blindly in the dark, indifferent to the real importance of oral manifestations, man worked with impunity on the teeth of his fellow men, little dreaming of the sacred ground upon which he was treading. But the law of progress led the honest worker to the edge of the desert of human hopes and fears where the bush of knowledge was illuminated with the fire of righteous endeavor. The voice of intelligence bade man to enter into his full privilege of useful service to his fellows and no longer yield to the handicap of the unacknowledged place which the mouth occupies in bringing good to man through every part of the body. With this awakening, the mouth received its rightful place as an essential part of the human system. The world is beginning to learn that the oral surgeon deals with conditions having myriad avenues of associations reaching to and influencing the whole economy of man.

To see and appreciate the importance of dental health is a great step forward in modern health service. Public opinion is gradually seeing the light and recognizing the power of dental hygiene to raise the standards of physical fitness. Perfection is the natural stage of man. Health is his normal heritage. Health is universal. There is far more health in the world than ill health. Healthy people are in the majority everywhere, yet we are conscious of the great activity necessary to care for the sick, the suffering, the physically deficient and the mentally abnormal. Dentistry is doing its full part in this service, and the public is richer because of the discoveries which dental forces are making for the comfort and benefit of the race. Dentistry is having a part in emphasizing the truth of the old adage:

> "Laugh and the world laughs with you,
> Weep and you weep alone."

Through its alleviation of pain, suffering, deformity and other physical discrepancies, it is bringing a normal state to thousands who otherwise would never be free because their troubles have their origin in oral conditions which need recognition and treatment before a cure is possible.

The question of the relation of sound teeth and a clean mouth to a normal body is a matter of public concern, and the public must be educated in this direction. Prevention rather than repair is the key to the situation. Prevention must be the source of inspiration, for the welfare of the individual. Once this becomes an illuminator of public conscience, recognition of the importance of oral perfection will lead the way to definite habits of thought that will establish a cure for present-day dental ills. The greatest progress in dentistry will be made when, out of the laboratory of mental research, men, women and children are taught to think right about their mouths and teeth, with a resultant activity that will give oral cleanliness its proper place among man's considerations for his physical betterment.

A well-organized dental health program that will bring cleanliness, physical fitness and respectability to a system of education is a service of value to the youth in the schools and to the community at large. Every child has a right to sound mouth tissues and equipment, in connection with a normal, well-ordered body. This is essential in order that his intellectual development may proceed unhindered by distress, abnormality, disease or neglect. The public school is not a charitable institution; but incidentally, with inspection and education, the public school clinic can scarcely

be omitted. It would be impossible to carry on an extensive practice of dentistry in the schools. But in order that the child of the unfortunate, or indigent, may be given the full privilege of educational advantages, it seems necessary to carry on a limited amount of dental service for those who cannot possibly secure the service elsewhere. Only the simplest preventive measures can be undertaken, if all concerned are to be treated fairly.

Experience in many school clinics over the land has proved that prevention rather than repair, comfort rather than suffering, cleanliness rather than disease, are the incentives that govern the activities of the school dispensaries. The very poor must be kept physically and mentally fit in order that they may be free from the detrimental influences that would hinder their grasp of the fundamental principles of an education. To this end, the school dentist serves in the dispensaries, at the same time educating his patient to an appreciation of dental health, inspiring him to independence and encouraging him to endeavor to find a way to purchase good dental service with his own savings.

DENTAL PROGRAM IN ST. CHARLES PUBLIC SCHOOLS

By FREDERICK G. MILLER, D.D.S., St. Charles, Ill.

SCHOOL dental service was started in the grade schools at St. Charles, Ill., in 1924, by a group of philanthropic women, whose only object was the welfare of the pupils. This group raised money in various ways and purchased three dental outfits, consisting of chair, cabinet, sterilizer, forceps, hand instruments and foot engines. The idea was popular and, in 1925, they engaged C. L. Smith, a local dentist, to work one day a week. Dr. Smith examined the teeth of all the pupils and charged a nominal fee for prophylaxis. The school board made up the remainder of his salary. The work continued to expand until the death of Dr. Smith in 1930, at which time I was appointed by the school board, which has paid me a regular monthly salary.

In order to get a more intimate contact with the pupils, the system at present in use was developed. The children in all grades from kindergarten up to and including the eighth grade are examined for dental defects during September of each school year. If the child requires dental attention, a notice is sent to the parents stating only that, in the judgment of the school dentist, the child should have dental care. This notice must be signed and returned to the school. As soon as all the examinations are complete, the pupils are sent, one at a time, to the clinic room, where the dentist and nurse can have a talk with them.

At this time, every effort is made to instil confidence in the child and to allay any fear of dental work and dentists. We have found that the most satisfactory way of accomplishing this is to give the teeth as thorough a prophylaxis as possible. The child will, in most cases, take pride in keeping the teeth clean, whereas he cannot get them clean enough himself. This painless operation also removes a good deal of the fear of the dentist that many children have acquired through contact with their elders and in

other ways. It is sometimes necessary to repeat this treatment before the lesson is driven home. The teachers are glad to cooperate, and they are requested to send back any child who does not care for his teeth properly. The advantage of having the pupil alone is great, as it is usually possible to ascertain the reason for failure to have the necessary repair work done. If the reason is fear, we are usually able to overcome the condition. If it is financial difficulties, we can learn why the parents cannot afford the dental work. The nurse is able to get these facts, and suitable action is taken. The P.-T.A., school welfare organization and some individuals have been interested enough to pay for the dental care of certain cases that do not come under the relief class. St. Charles has a mixed population, and many cases are handled without expense to the parents when the dentist and

REPORT OF SCHOOL DENTIST
District No. 87 . . . St. Charles, Illinois
Term 1941-1942

Grade	Lincoln School	Pupils	Cavities		100% Pupils		
			September	May	September	May	
1	Miss Smith	31	13	3	25	29	
2	Mrs. Griffin	33	26	5	22	31	2 pupils in Lincoln School have lost a total of 3 permanent teeth
3	Miss Richmond	31	41	10	16	28	
4	Miss Malloy	32	21	4	25	31	
5	Miss Turner	29	16	8	18	27	
6	Mrs. Driscoll	37	32	16	20	31	
	Total	193	149	46	126	177	93%
Grade	Shelby School						
1	Miss Brandenburger	39	10	0	35	39	100% room
2	Mrs. Lawrence	39	19	3	29	37	2 pupils in Shelby School
3	Miss Rood	38	43	16	21	33	have lost a total of 2 permanent teeth
4	Miss Stevenson	37	42	0	19	37	100% room
5	Miss Hansen	34	11	3	27	33	
6	Miss Emmert	37	21	0	0	37	100% room
	Total	224	146	22	131	216	96.5%
Grade	Haines School						
7A	Miss Jones	34	37	14	19	29	7 pupils in Haines School
7B	Miss Lindh	40	57	14	20	33	have lost a total of 12
7C	Mr. Paulson	17	31	21	8	12	permanent teeth
8A	Miss Munhall	34	39	10	19	33	
8B	Miss Davis	30	31	7	17	29	
	Total	155	195	66	83	136	90%
	Grand Total	572	490	134	340	529	93%

Number of permanent teeth missing in entire district, 17.
Lincoln, 93%; Shelby, 96.5%; Haines, 90%; General Average, 93%.
F. G. Miller, D.D.S., 107½ West Main St., St. Charles, Ill.

nurse find them really deserving cases, the parents refusing to apply for relief at the relief station. Many times, these parents will pay something toward the dental work, and the children have not been penalized because the parents are not able to pay the regular fee.

In the routine of our examinations, we often find deciduous teeth and roots which should be removed. The pupils consider it a treat to have them removed at the school, and the service has resulted in much better spacing of the permanent teeth. The school board appreciates the fact that we have had no epidemic of scarlet fever or rheumatic conditions since this policy was put into effect. Discretion is used in this part of the work and parents are contacted to avoid argument. However, we find that the parents are almost unanimously in favor of having this service rendered at the school. Usually, a dozen children are lined up waiting for the dentist, and no fear is exhibited by these patients.

The schools can truthfully say that not a day's time is lost to any pupil on account of toothache. This is the object of the St. Charles school dental service, and the school board is so thoroughly in favor of good teeth that pupils are excused for dental appointments. This is a great help to the busy dentist, and the teachers see to it that dental appointments are kept.

In order to stir up a friendly rivalry, we award each grade which has all dental work finished a banner and usually a treat of ice cream, and the local theater gives a pass to each pupil in a 100 per cent room. In this way, the children do all they can to get the dental work finished.

The teeth of all pupils are examined again during May of the school year and, in this way, a comparative record can be kept.

The 1942 report shows that 93 per cent of the pupils have had all necessary work completed, and the eighth grade goes into high school with only one pupil who is not in good dental condition.

Perhaps the greatest accomplishment of the work at St. Charles is the record on permanent teeth lost. June 1, our records show that only eleven pupils in a population of 572 have lost any permanent teeth. There are seventeen permanent teeth missing and some of these were lost by accident. The school board and the dental department feel that they have cause to be proud of their accomplishment.

In 1931, 30 per cent of the pupils had defective teeth. In 1942, only 7 per cent needed dental care.

The teachers are glad to cooperate as they enjoy looking at a roomful of children with clean teeth. The pupils become interested in their teeth and habits are formed which will be an asset all of their lives.

107½ West Main Street.

COUNCIL ON DENTAL THERAPEUTICS

MUCOTEX—NOT ACCEPTABLE FOR A.D.R.

Report of the Council on Dental Therapeutics of the American Dental Association, authorized for publication.

The Council's report holding Mucotex not acceptable for A.D.R. was submitted to the firm. The firm replied to the Council's letter, setting forth essentially that Mucotex was developed by the late W. S. York, D.D.S., who was the husband of the present proprietress of the firm. Furthermore, it was set forth that the product has been in use over a considerable period of time and the results obtained were uniformly satisfactory. No clinical data were presented, however. Objection was taken to the Council's report in that the chemical analysis of the product is incomplete, and no clinical tests were made to determine whether the product has merit. The referee has found that the firm's letter does not constitute evidence upon which the Council's report should be withheld from publication or fundamentally revised. The Council therefore voted to publish the following report:

Mucotex is a preparation promoted to dentists as a means of treatment of "diseases and infections of the oral cavity and surrounding parts." The advertising circular accompanying the trade package bears, among others, the following claims and recommendations:

> Mucotex for over fifteen years has been given thorough clinical tests in the treatment of diseases and infections of the oral cavity and surrounding parts by a great number of dental surgeons, and it has proven to be extremely efficient. . . . Remember Mucotex is indicated wherever there is infection, pain or soreness of the soft tissue of mouth and throat or when there is injury of soft tissue. It is especially recommended to prevent infection and should be used after every prophylaxis.

The package label of Mucotex does not bear a statement of composition. Thus, the product, if sold in interstate commerce, is marketed in conflict with the requirements of the Food, Drug and Cosmetic Act.

The Council requested the firm to provide information on the composition and properties of Mucotex. The firm did not reply to this request for information. As far as the Council is aware, the usefulness of the preparation has not been established by scientific evidence.

From the report of the Bureau of Chemistry, it may be deduced that Mucotex is essentially an alcoholic solution of salicylic acid, containing also small amounts of an alliaceous substance. Salicylic acid is, of course, a well-known compound. It possesses antiseptic properties, but is also an active irritant and somewhat corrosive. If salicylic acid is kept in contact with mucous membrane or even with the skin, corrosion and necrosis may result. Thus, the firm's claim "We have never seen Mucotex cause any permanent injury to the tissue" should be considered in the light of common knowledge of salicylic acid as presented in a number of standard textbooks on materia medica and pharmacology.

REPORT OF THE BUREAU OF CHEMISTRY

Two bottles of Mucotex (York Laboratories, Orlando, Fla.), price $2 per bottle, were submitted to examination. Each bottle contained about 23 cc. of green liquid with a strong odor resembling that of mustard oil.

Qualitative examination indicated the presence of ethyl alcohol, salicylic acid and an oily substance with a mustard oil odor and containing sulfur and nitrogen.

Quantitative analysis yielded:
Salicylic acid 20 gm./100 cc.
(End of Chemist's report)

From the chemist's report, it can be deduced that Mucotex is essentially an alcoholic solution of salicylic acid (20 gm./100 cc.) containing green coloring matter and an alliaceous oil.

Mucotex, which is marketed in conflict with rules 1, 2, 6, 7, 8 and 10, is therefore declared unacceptable for A.D.R.

A copy of the rules that govern the Council in the consideration of articles will be sent on request.

HAROLD L. HANSEN, *Secretary.*

ABSTRACT OF NOTICES OF JUDGMENT UNDER THE FEDERAL FOOD, DRUG AND COSMETIC ACT (ISSUED MARCH 1942)

N. J. 326. Misbranding of Pachanga Mineral Water. U. S. *v.* Tripo M. Lukovich, trading as T. M. Lukovich, D.C. This product contained excessive fluorine and would be dangerous to health if used as directed on the labeling. Its labeling failed to reveal the fact that it contained fluorine and failed to bear adequate warning against use by children. The labeling of one lot contained false and misleading representations regarding its efficacy in certain ailments and conditions and failed to bear an accurate statement of contents. Analysis showed that the article consisted essentially of sodium chloride, sodium sulfate, sodium bicarbonate, sodium carbonate, a fluorine compound, and a trace of an iron compound, dissolved in water. The total amount of dissolved matter was 2 per cent. Samples taken from the two shipments were found to contain 52.2 and 60 parts, respectively, per million of fluorine.

N. J. 328. Misbranding of Aspirol Tablets and Headache Tablets. U. S. *v.* 1,005 Bottles of Aspirol Tablets and 1,416 Bottles of Headache Tablets (J. R. Watkins Co., Winona, Minn.). The product Aspirol Tablets was labeled to indicate that it was an aspirin preparation, whereas it contained other physiologically active ingredients. Its label also failed to bear a statement of the quantity of acetophenetidin that it contained. The headache tablets contained acetanilid and their use as directed would be dangerous to health. Also the label failed to reveal the possible consequences of their use.

N. J. 330. Adulteration and misbranding of One Minute Toothache Sticks. U. S. *v.* 20 Dozen Packages of Toothache Stick (One Minute Remedies Co., St. Louis, Mo.). This product contained carbolic acid. It would be dangerous to health when used as directed in the labeling and would not be efficacious for certain conditions for which it was recommended in the labeling. It also contained a smaller percentage of carbolic acid than that declared on the label. Analysis showed that the article consisted essentially of carbolic acid (23 per cent), paraffin, cotton and small amounts of oil of clove and oil of cinnamon. The article was also alleged to be misbranded in violation of the Federal Caustic Poison Act, as reported in notices of judgment published under that act.

N. J. 345. Adulteration and misbranding of Heron's Pure Eucalyptus Oil. U. S. *v.* Norman C. Heron (N. C. Heron Co., Los Angeles, Calif.). This product did not meet the requirements of the United States Pharmacopoeia for eucalyptus oil. Its labeling also bore false and misleading representations regarding its efficacy in the conditions indicated here-

inafter. The article was alleged to be misbranded in that the statements borne on the bottle label were false and misleading, since they represented that it was pure eucalyptus oil; that it was an all-around family remedy, and was efficacious for internal or external use from the youngest to the oldest; that the article, when used alone or in connection with Heron's Liver Regulator, had no equal in the treatment of Bright's disease and diabetes; that it was the only remedy without an enemy, implying that it was a remedy approved by every one; that it was efficacious in the treatment of anything that originated from a cold, and that it was efficacious in the treatment of cough, whoopingcough, croup, sore throat, diphtheria, pleurisy, pneumonia, fever, stomach and kidney troubles, diabetes, catarrh, asthma, bronchitis, headache, earache, toothache, neuralgia, burns, poison oak, wounds of all kinds, consumption in its first stages, fever of all kinds, rheumatism, gravel, dyspepsia, kidney disease, and cuts; whereas it was not pure eucalyptus oil and was not efficacious for the purposes stated.

N. J. 351. Adulteration of epinephrine chloride solution. U. S. *v.* 12 Bottles of Epinephrine Chloride Solution (Difco Laboratories, Inc., Detroit, Mich.). This product had been shipped in interstate commerce and was in interstate commerce at the time of examination, at which time it was found that it did not conform to the requirements of the United States Pharmacopoeia.

N. J. 354. Adulteration and misbranding of halibut liver oil capsules. U. S. *v.* 24,000, 75,000 and 90,000 Halibut Liver Oil Capsules (White Laboratories, Inc., Newark, N. J.). All lots of the article were alleged to be adulterated in that another fish-liver oil had been wholly or in part substituted for plain halibut-liver oil. All lots were alleged to be misbranded in that they were offered for sale under the name of another drug. Portions were alleged to be misbranded further in that the statements, "Halibut Liver Oil . . . Capsules," "Halibut Liver Oil Plain" and "Halibut Liver Oil Pl." were false and misleading, since the article did not consist of halibut liver oil, but was a mixture of fish-liver oils.

N. J. 388. Misbranding of Parkelp and Parkelp Tablets. (Philip R. Park, Inc., San Pedro, Calif.) Analysis showed that Parkelp consisted of dried kelp (seaweed) and that the tablets were made of this material. The article was said to be misbranded in that numerous claims including those for usefulness in treatment of secondary anemia and rickets were false and misleading.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

POTASSIUM PERMANGANATE*

Potassium Permanganate-Rorer: A brand of potassium permanganate, U.S.P.

Manufactured by William H. Rorer, Inc., Philadelphia, Pa.
Compressed Tablets Potassium Permanganate, 1 grain.
Compressed Tablets Potassium Permanganate, 2 grains.
Compressed Tablets Potassium Permanganate, 5 grains.

PHENOLIC COMPOUNDS†

Morson's Kreosote-Moyco: A brand of creosote, U.S.P.

Distributed by The J. Bird Moyer Co., Inc., Philadelphia, Pa.

ESSENTIAL OILS AND RELATED PRODUCTS‡

Eugenol-Regal: A brand of eugenol, U.S.P.

Manufactured by Merck & Co., Inc., Rahway, N. J. Distributed by Regal Dental Company, Brooklyn, N. Y.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. Ed. 7, p. 187.
†A.D.R. Ed. 7, p. 179.
‡A.D.R. Ed. 7, p. 127.

COMMITTEE ON ECONOMICS

POSTPONEMENT OF THE MEETING OF INDUSTRIAL DENTISTS

THE Committee on Economics regrets to announce that owing to the cancellation of the Annual Meeting of the American Dental Association, it will not be possible to hold the meeting of industrial dentists which was scheduled for August 25 at Boston. The committee considers it unfortunate that the meeting must be postponed at this time. With the rapidly expanding industrial dental programs, there is a genuine need for a more adequate medium of exchange of ideas and information among the dentists participating in this specialized field. There has been an enthusiastic response on the part of the men engaged in industrial dentistry to the suggestion that they form a permanent organization representing this field. All indications pointed toward a most successful meeting.

It should be pointed out that this announcement is to be considered a postponement rather than a cancellation of the plan for the meeting. It may be possible to schedule the meeting during the midyear session of the Trustees of the American Dental Association, which will be held in Chicago during the month of February. Announcements will be made in future issues of THE JOURNAL regarding plans for the meeting.

Under the circumstances, it is especially fortunate that the United States Public Health Service has taken an active

interest in the problems of industrial dentistry. Their representative in this field, L. D. Heacock, and others who are acting in an advisory capacity are giving valuable assistance to state departments of health and to individual industrial concerns that are interested in developing this type of program.

The Committee on Economics will continue to act as a clearinghouse for information and in an advisory capacity with regard to problems of industrial dentistry. We shall be glad to hear from you.

Watch THE JOURNAL for further announcements.

R. M. WALLS, *Chairman,*
M. L. DOLLAR, *Secretary.*

STEPS IN THE INITIATION OF AN INDUSTRIAL DENTAL SERVICE

By JAMES M. DUNNING, D.D.S.,* New York, N. Y.

THE American Dental Association, through the adoption, at the Houston meeting, of the "Essentials of an Industrial Dental Service,"[1] marked out for industry the approximate limits of a dental service for employes.

The need for action on industrial dental service is too apparent to call for further emphasis at this time. Through the country's war effort, boom towns are springing up literally by the hundreds. Usually, the inhabitants of these communities have been separated from their regular dental practitioners, and, frequently, they are unable to obtain any dental service whatever in their new community. A constructive plan for industrial dental service, however, is not limited to wartime in its applicability. It is equally logical and desirable as a peacetime development.

The "Essentials of an Industrial Dental Service," as established by the American Dental Association, were not designed as a step-by-step procedure for a plant manager or a local dentist called into consultation by a plant manager to follow in establishing a dental program in a particular industry. Rather, it is the purpose of the "Essentials" to set forth in broad outline those types and standards of service universally acceptable in an industrial program. It is left to the individual industry to work out the details necessary to put these principles into operation. For instance, the "Essentials" states that "the division of dental hygiene of the state department of health should be consulted" on the matter of record forms, thus leaving the actual selection of the forms to be used to each state department. The "Essentials" also points out that before they are incorporated in the program, certain special services shall be submitted for approval to the state dental society. No attempt is made to dictate the procedure to be followed in conducting such consultations, and no procedure is established for estimating the needs of a particular industrial population.

The American Dental Association standards purposely make specific mention only of those items of dental service of such positive merit as to warrant national endorsement or so detrimental in their effect as to warrant national disapproval. Within the limits of these

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1. Committee on Dental Economics. J.A.D.A., 29:299, February 1942.

recommendations and restrictions, there are a number of procedures which require careful consideration and can be worked out through the local or state components of the American Dental Association to the entire satisfaction of the dental profession.

It is the purpose of this article to suggest in outline a plan for the initiation of an industrial dental program that will be effective in protecting the dental health of the employes and that will incorporate the standards set forth in the American Dental Association's "Essentials." The details of this plan are given below.

OUTLINE FOR INITIATION OF DENTAL SERVICE IN AN INDUSTRIAL PLANT HAVING ONE THOUSAND OR MORE WORKERS

1. Make an initial survey of dental needs and facilities. The steps involved in the initial survey fall into four main subdivisions:

(a) Secure data from personnel division as to age and sex composition of working force, approximate economic level and approximate length of residence in area of work.

(b) Survey a sample of the working force to give by age and sex (five year groups preferable) the following data:

(1) Dental caries experience in DMF teeth per person, or per hundred cases.

(2) Approximate dental needs per hundred cases, in number of unfilled caries lesions apparent to explorer, and any other appropriate measures.

(3) Proportion of working force able to go and interested in going to a private dentist.

(c) Survey the residence area of workers for number and availability of dentists. Enlist the cooperation of the local dental society on this, if possible.

(d) Consult the state or local dental society, the division of dental hygiene of the state department of health and other appropriate health authorities regarding program for company under consideration. The advice of the United States Public Health Service is available, if needed, through the state department of health. Obtain the state's sanction for x-ray, prophylaxis and treatment service if any seem desirable (see paragraph 7 of American Dental Association Industrial Standards.)

2. If dental needs are definite, install a dental examination service in accordance with the American Dental Association standards:[1]

(a) Appoint a competent dentist or dentists for an appropriate number of hours per week. Full-time dentists would not ordinarily be desirable. A rough estimate should first be arrived at for the approximate number of working hours per week needed per thousand employes.

(b) Secure adequate properly lighted space for dental service. This space should preferably be on the company premises, but if any nearby private dental office is made use of, it should be rented *in toto* for a definite proportion of time each week. Patients should not be sent to the proprietor of this office at any other time, except in an emergency, nor should they, under ideal conditions, ever become private patients of the proprietor. If space is on the company's premises, a dental chair, folding or permanent, cuspidor facilities, an x-ray machine, an instrument cabinet, a boiling water sterilizer, appropriate examining instruments and x-ray films should be available. Not too far away should be dark-room facilities with tanks and supplies.

(c) Install an adequate dental record system, including a dental record chart of suitable design and filing cabinet. The record charts must contain at a minimum a tooth and mouth diagram form on which caries lesions and other important oral conditions can be charted, as well as x-ray findings and a follow-up record for a period of not less than five years at an ordinary rate of recall. In filling out the record chart, a listing of DMF teeth (in separate categories) is required in every

case, both for caries experience and for present dental needs, and for identification purposes.

(d) Appoint a dental assistant or hygienist to full-time duty.

(e) Arrange with the personnel division of the company for a schedule whereby employes can be examined within working hours, and in such a way that the entire company will be covered once a year.

(f) Arrange for initial talks to the employe group on the impending dental service, stressing the preventive value of the service, the importance of cooperation on the personnel schedule and the important rôles played by nutrition and dental hygiene.

(g) Proceed with dental examinations and the completion of records. Take x-ray pictures in all indicated emergency cases and for as wide a range of routine conditions as possible, dealing with those in which infection is suspected. Note for further study and action any unusual findings of possible occupational origin.

(h) Give any personal dental health instruction which seems needed.

(i) At the conclusion of each examination, assist as far as possible in routing the patient to his private practitioner so that treatment may be obtained. If the patient is not in a position to go to a private practitioner, assist as far as possible in routing him to a clinic, or if the patient does not have a private dentist, but wishes a new connection, furnish the names of three dentists from a prearranged list of practitioners. (See procedure I (c)). The examining dentist may or may not have a special understanding with the private practitioners on his list as to fee schedule, but the prerogatives of the private practitioners should be safeguarded. The patient should be excused from work for such outside dental treatment (including emergencies) as cannot be performed at other than working hours without undue hardship.

(j) Make available to the private dentist or outside clinic x-ray pictures involving problems of treatment not cared for in the company clinic, with such simple explanation as may impress their importance upon the patient, but not with a definite diagnosis as to pathologic conditions found, unless such a diagnosis can be made without embarrassment to the private dentist or outside clinic.

(k) Install an emergency service designed to give palliative treatment to those employes who develop complaints on the premises and can be made comfortable until able to reach their private dentist or outside clinic after hours. This service would involve consultations on emergency problems as well as palliative treatment.

(l) At one year intervals, recall employes for reexamination; note the progress of dental treatment, and give further health education if needed. In industries in which occupational hazards are evident or an unusually high caries rate prevails, more frequent recall should be made.

(m) Be prepared to consult the private dentist at all times as to matters of treatment, or the personnel division as to matters of attendance record. It is to be borne in mind that the only compulsory element in the dental service is that whereby the patient reports for examination and recording of findings. These findings should be available to the patient and to the medical division, and for identification purposes, but the personnel division should be interested in them only as possible explanations for already noted defects in attendance, or as evidence in the study of occupational disease.

3. As a result of the findings under procedure, establish additional dental services to the limit of the interest of the employer and the sanction of the state or local dental society. Probably, the best order of such additions to service would be as follows:

(a) Prophylactic service on a basis of one prophylaxis per year per employe. (The value of the service should be estimated not only for its effect on the health of the employes, but also because it removes a good deal of the load from the examining dentist and from those responsible for health education). (See procedure II [1] regarding conditions where more frequent prophylactic service may be advisable.

(b) A dental treatment service confined to those items of treatment not readily obtainable by any or by a significant part of the working force from outside private practice or clinics. A treatment service would ordinarily start with exodontia, oral surgery and cement fillings (the cement to be placed in cavities from which all carious material has been removed, and to serve as a foundation for future permanent fillings). Further extension into the field of amalgam fillings, simple synthetic porcelain and the more needed phases of prosthetic work should be made only in exceptional cases.

4. Survey the industry for possible occupational hazards, noting any significant findings at the time of examination and investigating the cause, in cooperation with those responsible for the other phases of industrial hygiene in the company. Research data should be compiled on occupational hazards, and all possible therapeutic and preventive measures be put into effect.

5. Give attention to the amount of dental service available to employes' families (correlate with procedure 1 [c]), and be prepared to cooperate with local and state dental societies and other authorities in initiating the establishment of any needed new private dental offices and clinic facilities in the community.

In consideration of the wide variety of local situations which may arise, the procedure described above has been kept as flexible as possible. Particular note should be taken of the different types of dental treatment service that may be included in an industrial program. (See procedure 3). It is not by any means to be assumed that all of these items should be made a part of a given industrial service. In fact, many services may function very effectively with nothing more than the initiation of x-ray and palliative emergency service, and the other items included in procedure 2. The treatment services described under section 3 are intended to give an idea of the maximum needs that might be met with in an industrial dental program and to suggest the probable order of importance in which these needs should be met.

It will be noted that the treatment services outlined in the plan (procedures 2 [g], 2 [j] and 3) go beyond the limits now permitted by the American Dental Association "Essentials" for dental services in new industrial dental programs. The present war emergency would seem to justify an expansion of those dental services under certain circumstances to include treatment not covered by the "Essentials." Such an expansion of services should be limited strictly to areas where dental facilities are not adequate to care for the needs of a suddenly expanded population. In no case should such services be instituted without the consent of the local dental society. Preferably, such an expansion of services should be initiated by the local society. In local areas faced with an emergency situation as regards dental health, the dental services offered by the industrial program might go far beyond the limits which the American Dental Association would recommend for adoption throughout the entire nation.

The question as to who shall initiate an industrial dental program, conduct the preliminary surveys and make the necessary contacts with the dental society and the state department of health has purposely been avoided. Ordinarily, it would seem wise that the manager of the plant involved become aware of the den-

tal needs of his employes, possibly through the advice of his own private dentist or through a contact with the local dental society. The manager would then select a consultant. This person should be approved, possibly even suggested, by the local dental society. The manager and the dental consultant would then cooperate in carrying out the surveys necessary before establishing the service. It would be very appropriate, however, for the state health department, the United States Public Health Service or some other health agency to interest itself in the problem and give assistance to an extent greater than that involved in item 1 (d). The Public Health Service, through the chief of its division of industrial hygiene, has announced its intention to offer such assistance where needed, and it is interesting to note that this year for the first time a dentist has been added to the consultative staff of this division. In the Health and Sanitation Unit of the National Housing Agency, another dental officer of the Public Health Service is concerned with seeing that dental practitioners shall be encouraged to locate in or near the new housing projects that are springing up in war industry areas.

It is the hope of all who are working with the problem that the impetus to be given industrial dental service by the war effort during the next few years will result in a permanent peacetime program. No essential differences between wartime and peacetime needs are apparent at the present writing, except in the matter of urgency.

COUNCIL ON DENTAL EDUCATION

AMERICAN DENTAL ASSOCIATION SURVEY OF DENTAL SCHOOLS, 1942-1943

The Council on Dental Education has completed plans for the beginning of the inspection of dental schools next October and has announced the following general course of procedure:

GENERAL OUTLINE OF PROCEDURE

I. *Requirements.*—The fundamental basis for the establishment of a list of approved dental schools in the United States is the "Requirements for the Approval of a Dental School," originally issued by the Council on Dental Education of the American Dental Association in December 1940 and reissued as subsequently amended in November 1941. These requirements dealt in general items with:

The aims and purposes of the Council on Dental Education.
University relationship.
Financial management and support.
Physical plant.
Enrollment.
Promotion and graduation.
Library.
Admission.
Instruction.
Hospital relationship.
Faculty.
Curriculum.
Statement of general policy.

II. *The Securing of Documentary Data.*—The second step is the securing of documentary data from each of the thirty-nine dental schools in the United States which have sought the approval of the Council. These data are collected in order to present a complete factual picture of the organization and conduct of a dental school for the benefit and guidance of the visitors who will later appraise the work of the schools directly. These blanks, eleven in number, distributed to the dental schools in Novem-

ber 1941 and in the weeks following, are listed as follows:

Form A. Aims and Objectives.
Form B. Organization and Administration.
Form C. Physical Plant.
Form D. Financial Management and Support.
Form E. Admission.
Form F. Instruction and Research.
Form G. Clinical Dentistry.
Form H. Library.
Form I. Hospital Relationship.
Form J. Faculty.
Form K. Curriculum.

III. *The Compilation of Documentary Data.*—The third step is the compilation of the documentary data on a comparative basis. It is expected that all the forms from the thirty-nine dental schools in the United States will be filed with the secretary of the Council before August 1, 1942. The data thus secured will be collated and compiled during the summer of 1942 and arranged on large sheets showing comparative data for each of the thirty-nine dental schools. These large comparative summary sheets, thirteen in number, will be labeled as follows:

Organization and Administration.
Physical Plants.
Admission of Students—A.
Admission of Students—B.
Libraries.
Faculties.
Receipts.
Expenditures.
Instruction and Research—A.
Instruction and Research—B.
Clinical Dentistry.
Curriculums.
Graduate and Postgraduate Courses.

As far as possible, on the basis of these comparative data, the dental schools will be ranked under each of these headings from one to thirty-nine. This preliminary ranking in each of these designated areas will be subject to revision after the schools have all been visited and the reports of the visitors have been collated and compiled.

IV. *Visitation of Schools.*—The fourth step will be the visitation of dental schools by members of the Council and by experts designated by the Council. The visitation of schools will begin in accordance with previous announcements in October 1942. It is expected that at least three representatives of the Council, ordinarily consisting of one member of the Council, one expert appointed by the Council and the secretary, will spend three days in each school. The Council member will devote himself primarily to an appraisal of the teaching of clinical dentistry, the appointed expert to the teaching of the basic sciences and the secretary to matters relating directly to organization, admission, library, university relationship and administration. The committee of three will meet daily to compare their findings and will complete their reports immediately after the visit. Blank forms will be provided for this purpose and specific instructions will be issued in advance to all visitors.

V. *Pattern Maps of Dental Schools.*—After all of the dental schools have been visited and the reports of all visitors have been studied and employed in the revision of the comparative data sheets, pattern maps will be drawn up for each of the thirty-nine dental schools and each school will be ranked on seventy-six separate criteria as in the highest tenth, the second tenth, the third tenth, the fourth tenth, the fifth tenth, the sixth tenth, the seventh tenth, the eighth tenth, the ninth tenth and the lowest tenth. The seventy-six criteria will each be defined in advance and will be distributed under thirteen general headings as follows:

Organization and Administration:
1. University Relationship.
2. Medical School Relationship.
3. Environment.
4. Business Management.
5. Educational Leadership.
6. Faculty.
7. Records.

Admission:
8. Administration.
9. Quantitative Requirements.
10. Qualitative Requirements.
11. Distribution.
12. Selection.

Physical Plant:
13. Cost and Value.
14. Adequacy.
15. Maintenance.
16. University Facilities.

Library:
17. Personnel.
18. Physical Facilities.
19. Number of Volumes.
20. Periodicals
21. Use.
22. Yearly Expenditure.

Faculty:
23. Training and Experience.
24. Scientific Interest.
25. Professional Interest.
26. Salaries.

Curriculum:
27. Clock Hours—Lecture.
28. Clock Hours—Laboratory.
29. Clock Hours—Clinic.
30. Clock Hours—Total.
31. Self Surveys.
32. Integration.
33. Balance.
34. General Objectives.

Instruction:

Basic Science:
35. Facilities.
36. Personnel.
37. Objectives.
38. Adequacy.
39. Integration.
40. Evaluation.

Clinical Dentistry:
41. Facilities.
42. Personnel.
43. Objectives.
44. Adequacy.
45. Integration.
46. Evaluation.
47. Means of Improvement.
48. Student Guidance.

Hospital Facilities:
49. Location.
50. Adequacy.
51. Use.

Finance:

Income:
52. From Students.
53. From Clinics.
54. From Endowments.
55. From Other Sources.

Expenditure:
56. Salaries.
57. Maintenance and Equipment.
58. Research.
59. Other Purposes.
60. Control.

Research:
61. Support.
62. Character.
63. Personnel.
64. Facilities.
65. Results.

Graduate Work:
66. Postgraduate Courses.
67. Graduate Courses.
68. Degrees.
69. Control.

Standing of Graduates:
70. A. D. A. Memberships.
71. Success in Examinations.
72. Distinction.

Alumni Organization:
73. Membership.
74. Publication.
75. Loyalty.
76. Directory.

VI. *A List of Approved Schools.*—The final step in this process will be the establishment and announcement of a list of approved dental schools. It is hoped that all of the assembled documentary data, the reports of the visitors to the schools and the pattern maps will enable the Council to reach an objective conclusion in appraising each school. This task completed, the Council will be faced with the problem of drawing the line between those schools which meet its standards and may be approved and those which fall below its standards and may not be approved. All the data furnished the Council will be regarded as confidential and no public use will be made of them so as to identify any particular school. Visitors will be requested not to pass private judgment upon schools that they visit or make any public use of the information they secure. Each school, if it desires, may have a copy of its own pattern map and a concise statement of the reasons why it is not approved if it falls within the group not approved.

COMMITTEE ON LEGISLATION

RECENT DECISIONS

DENTAL PRACTICE ACTS—CONSTITUTIONALITY—DENTAL LABORATORIES PROHIBITED FROM ADVERTISING TO THE PUBLIC

THE Florida State Board of Dental Examiners brought a suit against the owner of a licensed dental laboratory seeking to enjoin him from violating that provision of the Florida Dental Practice Act which prohibits dental laboratories from advertising to the public or constructing dentures for any one except upon the prescription of a licensed and registered dentist. The complaint of the board alleged that the defendant solicited the public to come to his laboratory for dentures by advertisements in the daily papers. The public, when they responded, were directed to a licensed dentist for a prescription. The dental board asked that this advertising in violation of the law be prohibited. The lower court, after hearing the evidence, issued an injunction prohibiting the defendant from advertising. The defendant then appealed to the Supreme Court.

The Supreme Court first stated its belief that the Dental Practice Act did not violate either the Constitution of Florida or of the United States of America. The defendant was wrong, the court stated, when he contended that the act deprived him of his property without due process of law; of the right to trade; of his right of freedom of speech and of the press; of his right to contract; of his right to trade in interstate commerce, and of the equal protection of the laws, and that the act was arbitrary and unreasonable. The court also stated that the dental act did not violate the Florida Constitution because it prohibited advertising by dental laboratories without so stating in the title of the act.

The law has been settled on good reason that regulation of the practice of dentistry is subject to the police power, said the court. The appellant's contention, when reduced to its last analysis, is that he is not a dentist, but is a business man and, for that reason, he should not be restrained from advertising in order to foster his business. It is true his type of business has been exempted from the dental act, but the same act which affords the exemption enjoins advertising by those exempted. The question is, then, is the act in question arbitrary and without reason? The legislature found as a fact that the practice of dentistry affects the public health. This is a fact of common knowledge. The legislature also found that only those duly qualified should practice dentistry. The purpose of the law is protection of the general public. Let us see then how the public is best protected. The appellant is admittedly not amenable to the act as a dentist. If the public is lured to the appellant's "business establishment" by convincing advertisements, the obvious purpose of the appellant is to sell dentures without regard to the medical need for them. If it is urged that they are never furnished except on prescription of a duly licensed dentist, the question arises, whose patient is the customer? If he comes to the business man (defendant) and is sent by the latter to a dentist, the temptation is great to prescribe dentures. The chances are enhanced that, unless the prescription favors the appellant's business, few patients will be sent to the same dentist thereafter. We

do not think that this practice is conducive to the loyalty that should exist between patient and doctor, concluded the court. We think, therefore, that the legislature had a sound reason to enact a law to see that this situation would not arise. While we know that a good dentist would not sacrifice his judgment for money, we have truly said that those learned in the sciences recede from the common and accepted standards of honesty.—Oshins *v.* York, S. Ct. of Fla., June Term, 1942. The decree is affirmed.

LIABILITY OF DENTIST FOR UNAUTHORIZED OPERATION

By LESLIE CHILDS, Indianapolis, Ind.

AT first glance, it may be difficult to see how a dentist could ever be called to account for performing an unauthorized operation. For surely, it may be reasoned, no dentist, in the absence of most unusual circumstances, would operate without the patient's consent expressed or implied, which would constitute an authorization.

However, this viewpoint fails to disclose a complete picture of the subject. For example, first, where a dentist through negligence extracts the wrong tooth, the operation clearly is one unauthorized. Secondly, in the absence of an understanding between the dentist and the patient as to what operation is contemplated, the dentist may run a grave risk of having operated without authority if the patient thereafter claims the operation was not according to his or her instructions or consent.

EXTRACTION OF WRONG TOOTH

In Krompoltz vs. Hyman, 70 Pa. Super. Court, 581, the plaintiff applied to the defendant dentist to either treat or extract an aching tooth. Through a misunderstanding as to the tooth meant, the defendant extracted a sound tooth. When this was called to the defendant's attention, he extracted the ailing tooth, but this did not prevent the plaintiff from suing for damages. The case went to a jury and resulted in a judgment for the plaintiff for $250. On appeal, the higher court, in checking the record and in affirming the judgment, in part said:

> The evidence, though somewhat conflicting, established a case for the jury. Without reviewing it in detail, the appellee [plaintiff] testified that he went to the appellant [defendant] and requested that he be given medicine for the aching tooth, or that it be pulled. While he did not speak English very well, the defendant understood he wanted a tooth treated, or, if it could not be treated, it was to be extracted. This called for the exercise of ordinary skill and judgment by the operator as it is customarily practiced.
>
> But when the appellant, without consent or cause, extracted a sound tooth, he was guilty of negligence beyond question. He afterwards removed the tooth about which the plaintiff had been complaining. . . . A dentist who without justification pulls a perfectly sound tooth might be said to be guilty not only of carelessness, but also of wanton recklessness. The judgment is affirmed at the cost of the appellant.

So much for the "wrong tooth" phase of the subject, and now let us turn to the second division thereof; i.e., what may be termed "misunderstanding" situations.

In Throne vs. Wandell, 176 Wis. 97, 186 N.W. 146, the plaintiff's dentist advised her to have an x-ray picture taken

of certain of her teeth in order that their true condition might be disclosed; presumably for his guidance in their treatment. The dentist then gave the plaintiff a form card that outlined the teeth, and drew a line through the teeth that were to be x-rayed. The card had printed upon it the words, "Kindly mark teeth to be extracted."

The dentist then instructed the plaintiff to take the card to another dentist, Dr. W., who specialized in extractions and x-ray work, for the purpose of having the picture taken. It may be noted that neither the plaintiff nor her dentist had anything in mind other than to have the x-ray picture taken by Dr. W.

Arriving at Dr. W's office, the plaintiff presented the card and Dr. W. took this to mean that the plaintiff desired the marked teeth extracted. The plaintiff seated herself in an operating chair, gas was administrated and Dr. W. extracted the six teeth that were indicated, or that he thought were indicated, by the card. Thereafter, the plaintiff protested that she had not come for extractions, but for an x-ray examination.

In due time, the plaintiff sued for damages on the ground that the teeth had been extracted without her consent. The evidence was in conflict, but the trial resulted in a judgment for the plaintiff in the sum of $3,500. The defendant appealed. The higher court held that the damages awarded were excessive, but in indicating that a judgment for $2,000 would stand, and, in upholding the plaintiff's right to recover, in part said:

> The main question involved in this case is: Were plaintiff's teeth extracted by Dr. W. without her consent? . . . There is no dispute in the evidence that the plaintiff was advised by [her dentist] to obtain an x-ray examination, and not to have the teeth extracted. It is true that the card made out by [her dentist] and handed to the plaintiff did not indicate anything with reference to an x-ray examination. On the contrary, the card indicated on its face that the teeth were to be extracted.
>
> The evidence is also undisputed that the plaintiff, before the extraction of her teeth, did not know what the card contained, and that she entered the office of Dr. W. for the purpose of having an examination made of her teeth. . . . She testified positively that, upon entering the defendant's office, she told the defendant that she had been sent by [her dentist] for an examination. . . .
>
> Right here, there is a very sharp conflict in the testimony of the plaintiff on the one side and the testimony of the defendant and his two assistants on the other side. While in number the defendant has three witnesses opposed to the testimony of the plaintiff, standing alone, it would not appear from all the facts and circumstances . . . that the plaintiff's testimony is not highly credible, and that the jury was warranted in answering the question of the special verdict in the manner in which it did.

In McClees vs. Cohn, 158 Md. 60, 148 Atl. 124, we find reported another misunderstanding. Here, the plaintiff applied to the defendant dentist to extract two so-called "baby roots" which were causing her inconvenience. The defendant examined the plaintiff, remarking, "These two have got to come out." At this time, the plaintiff supposed the defendant was referring to the two baby roots, which she claimed to have pointed out to be extracted. But, as a matter of fact, the defendant was referring to two lower molars which he found to be inflamed.

The defendant thereupon extracted the two lower molars instead of the two baby roots, and the plaintiff thereafter brought the instant action for damages. The case went to a jury, and the plaintiff was awarded $150 damages. On appeal, the higher court in affirming the judgment had this to say:

> It would be consistent with the dentist's [defendant's] testimony that he meant or indicated the two lower molars when he said "these two have got to come out," but it is a question of fact for the jury whether the plaintiff went to the dentist because she

was suffering pain from her teeth generally and submitted to his judgment, or went there to have two roots extracted, and, in violation of her instructions and without her consent, he pulled two lower molars instead. If the former, he was entitled to a verdict; if the latter, she was. . . .

This is not a case wherein an emergency arose calling for immediate action in order to preserve the life or health of the patient and it was impracticable to obtain her consent, or one wherein, in the course of an operation, conditions not anticipated were discovered which, if not removed, would endanger the life or health of the patient.

There was no such emergency here, and if the plaintiff, as she contends, engaged the defendant to extract the teeth indicated by her, her consent before extracting any others was necessary, and the contradictory statements of dentist and patient as to what was said and done made it proper for the trial court to submit the case to the jury. . . . Finding no error, the judgment will be affirmed.

Clearly, cases involving unauthorized operations will generally turn upon the facts grounded upon allegations of resulting injury to the patient. When, if ever, may an unauthorized dental operation be justified on the grounds that it was proper and proved beneficial? Doniger *et al.* vs. Berger, 271 N.Y.S. 30, 241 App. Div. 23, is in point.

DENTIST USING OWN JUDGMENT

Briefly, the plaintiff was sent by her regular dentist to the defendant to have a lower left first molar extracted. The defendant, an oral surgery specialist of high standing, proceeded to make his own examination and diagnosis, and discovered that the second molar, instead of the first, was infected and was the tooth to be extracted.

Then, without a clear understanding with the plaintiff on this departure, the defendant extracted the second molar. Suit for damages followed. The trial evidence was undisputed that the defendant's diagnosis was correct and the operation beneficial to the plaintiff. Despite this, a judgment for $700 was rendered against the defendant. On appeal, the higher court in reversing the judgment reasoned:

The real question presented is, Which was the right tooth to extract? . . . The result accomplished is the best proof that the defendant properly diagnosed the case and extracted the tooth which had been causing the pain. The conclusive proof of that fact is that the pain ceased and the tooth which plaintiff says should have been extracted is still in her mouth. . . .

The record discloses that, despite the fact that the defendant made a proper diagnosis and extracted the tooth that was giving the plaintiff pain, he has been penalized by the imposition of a judgment for damages upon the ground that he extracted the wrong tooth. It is clearly shown by the evidence that he not only diagnosed the case properly, but performed his work in a commendable manner. . . . Judgment reversed. . . .

To the foregoing majority opinion, however, one justice dissented and, among other things, said:

In the circumstances [of the case], the defendant was not at liberty to use his own judgment and was required to follow plaintiff's wishes. If he disagreed with the diagnosis of [plaintiff's regular dentist] . . . he should have so advised the plaintiff and obtained her consent before proceeding to act contrary to instructions. . . . A proper diagnosis and skillful and effective treatment is no defense. . . . I am of opinion, therefore . . . that the judgment should be affirmed.

So, while the majority opinion constitutes the law of the case, its force is tempered by the language of the dissenting opinion. And, taken together, the opinions illustrate the risk assumed by the defendant in operating other than as instructed by the plaintiff. Had, by any chance, the defendant's diagnosis and action proved mistaken, even by a shade, it is difficult to see how he could have escaped liability therefor.

CONCLUSION

On the foregoing cases, it is plain that, as a general rule, a dental operation can

be justified only when based upon the consent of the patient; that an unauthorized operation, even though impelled by a proper motive, cannot be justified on that ground, and that motive is not a defense and can serve only as an item in measuring the damages.

True, in the last case reviewed, the defendant dentist was held not liable because of the outstanding success of his diagnosis and treatment. But the facts and circumstances involved were very unusual. And even here the defendant was put to the expense of defending a lawsuit through the courts.

By and large, then, a dentist may well be certain of agreement between himself and a patient before operating. Moreover, a policy of hewing to the line in following out the agreement would seem a prudent course, as a safeguard against the possibility of being called upon to defend an action for an alleged unauthorized operation.

PAN AMERICAN RELATIONS COMMITTEE

THE FIRST INTER-AMERICAN ORTHODONTIC CONGRESS

NEW ORLEANS, LOUISIANA, MARCH 16-21
WASHINGTON, D. C., MARCH 23-28
KELLOGG FOUNDATION, UNIVERSITY OF MICHIGAN, APRIL 1-JUNE 12

By CLAUDE R. WOOD,* D.D.S., Knoxville, Tenn.

THE American Association of Orthodontists, realizing the benefits that could be derived from an interchange of orthodontic thought throughout the Americas, proposed a Pan American orthodontic congress. To this congress were to be invited representatives of orthodontic societies of the Western Hemisphere and those interested in orthodontics in countries where societies were non-existent.

Resolutions setting forth the aims and purposes of such a congress were passed unanimously by the association at its annual meeting in April 1939. The secretary was instructed to mail a copy of these resolutions, with an explanatory letter, transmitted in Spanish, to the existing societies and to those individuals in the Western Hemisphere whom he knew to be interested in the subject of orthodontics. Immediately, responses, all of which were of a favorable nature, began to be received. A second letter, reporting the responses received and the progress made, was sent out in the early part of 1940.

A report was given to the board of directors of the American association at its meeting in Chicago in 1940. The incoming president elect, formerly the secretary, was instructed to continue the contacts established. At the annual meeting in 1941, in New York City, the president elect gave the board of directors a detailed report. The board voted to recommend to the association that the

*Member Pan American Relations Committee.

incoming president be authorized to proceed with the organization of an inter-American orthodontic congress, and specified that the 1942 meeting should be pan-American in nature. The interrelations committee made such a recommendation to the association, which was unanimously accepted.

Immediately upon adjournment of the annual meeting, a conference was held with the cultural relations division of the state department of our government, at which time the aims and purposes of the proposed congress were set forth. The cultural relations division expressed a willingness to aid the association in every way possible, offering their full cooperation.

Communications were sent to the Argentine and Mexican societies of orthodontists, the two then existing orthodontic societies in Central and South America, and to individuals in many of the Central and South American republics. These societies and individuals were found to be in unanimous accord regarding the formation of an inter-American orthodontic congress. Plans were instituted for the establishment of committees in each of the twenty inter-American republics. In the formation of these committees, we received the full support and able assistance of Armando Monti, president of the Argentine Society of Orthodontists, and Samuel Fastlicht, president of the Mexican Society of Orthodontists, as well as many individuals in other republics.

Another conference with the cultural relations division of the state department was held, and the progress which had been made was reported. The cultural relations division suggested that contact be made with the office of the coordinator of inter-American affairs. In compliance with this suggestion, a conference was held with the coordinator's office, at which the aims and purposes of the congress were set forth, together with a review of progress. The office of the coordinator showed an intense interest in the project, and gave encouragement and valuable advice as to continuation of the project.

Contacts with interested individuals in the inter-American republics were continued, and the careful selection of delegates was started. Continuous contacts were maintained with the offices of the coordinator and the cultural relations division. After careful consideration, a complete list of the delegates was submitted to each of these offices. This list was composed of outstanding educators and practitioners of dentistry and orthodontics in their respective countries. The cultural relations division, upon recommendation of the American Association of Orthodontists, issued an invitation to one representative in each of the republics in the Western Hemisphere.

Acceptances were received from the following representatives of the inter-American republics:

David Cohen, Buenos Aires, Argentina
Virgilio Moojen de Oliveira, Rio de Janeiro, Brazil
Jaime Zamorano, La Paz, Bolivia
G. Vernon Fisk, Toronto, Canada
Louis de la Carrera, Santiago, Chile
Roberto Chartier, San Jose, Costa Rica
Sergio Giquel, Havana, Cuba
Horacio Read, Ciudad Trujillo, Dominican Republic
Enrique Ripalda, Quito, Ecuador
J. Benjamin Zavaleta, San Salvador, El Salvador
Alfredo A. Morales, Guatemala, Guatemala
Jules Thebaud, Port Au Prince, Haiti
Alberto A. Smith, Tegucigalpa, D. C., Honduras, A. C.
Samuel Fastlicht, Mexico City, Mexico
Fernando Fuentes, Managua, Nicaragua
Manuel M. Diaz, Panama City, Panama
Rodolfo Pagano, Asuncion, Paraguay
Ricardo Salazar, Lima, Peru
Oscar Aldecoa, Montevideo, Uruguay
Jose Carrillo Araujo, Caracas, Venezuela

No doubt, this was one of the most widely representative gatherings of men interested in the science of orthodontics. The program committee of the American

Association of Orthodontists arranged a program especially designed for the benefit of our inter-American guests. The interrelations committee had designed an additional two days of postgraduate study to follow the New Orleans meeting. Every one was deeply impressed with the seriousness with which the inter-American delegates entered into the discussions and study of the problems presented.

The entertainment feature was not entirely eliminated, as it was the desire of the association to entertain our friends south of us in a manner typical of true American hospitality. On the evening of the first day of the meeting, a reception was given at Antoine's famous restaurant. Here, members of the Association met the delegates from the respective countries. Another impressive occasion was the formal state dinner given in the Blue Room of the Roosevelt Hotel on the last evening of the meeting. The flags of all of the inter-American republics were placed on the rostrum, the ends being flanked with the American and Canadian flags, an arrangement very symbolic of the close friendship which had developed among all the delegates.

Business meetings were held by the delegates, when several problems were discussed, among which was the proposal that this be the first of many inter-American orthodontic congresses. An executive committee was selected to complete the work of this congress, which includes the publication of the proceedings and other matters pertinent to the closing of the congress.

The following were named as officers of the congress and members of the executive committee:

President: Claude R. Wood, Knoxville, Tenn.

Secretary-Treasurer: John W. Ross, Philadelphia, Pa.

Executive Committee: Representing the United States: Claude R. Wood, Knoxville, Tenn., John W. Ross, Philadelphia, Pa., and Brig.-Gen. Leigh C. Fairbank, Washington, D. C.

Dominion of Canada: G. Vernon Fisk, Toronto.

West Indies: Sergio Qiquel, Havana, Cuba.

Mexico: Samuel Fastlicht, Mexico City.

Central America: Alfredo A. Morales, Guatemala, Guatemala.

South America: Armando Monti, Buenos Aires, Argentina, Ricardo Salazar, Lima, Peru, and Oscar Aldecoa, Montevideo, Uruguay.

The executive committee made a proposal that one representative from each country represented at the Congress be made an honorary president of the congress. This proposal met with unanimous approval and one representative from each country was so named.

At the conclusion of the meeting in New Orleans, the representatives left in a private car for Washington. They enjoyed an eight-hour stopover in the City of Knoxville, the home of the president of the American association, who received them in his home. After this reception, a dinner was given at the Cherokee Country Club by the Dental Society of Knoxville.

Upon arrival in Washington, the delegates were received by the Pan-American Union, with Dr. Rowe as official host.

A week of scientific study had been arranged by the Army Dental School at the Army Medical Center. The guests entered into this work with the same enthusiasm and zeal that they had manifested in New Orleans. At this course of study, nearly every branch of dentistry was presented, particular stress being placed on rehabilitation of injuries received during war time. This seemed particularly fitting, as several of the delegates were connected with the dental service of the army or navy of their country.

At the conclusion of this course of study, the inter-American visitors were

given a state dinner, at which were present many members of the embassy staffs of the respective countries.. Also present were representatives of the cultural relations division of our government and the office of the coordinator of inter-American affairs. Many representatives of the dental services of the United States Army, Navy and Public Health Service were present. Also, as special guests were the President, the President-Elect and the Executive Secretary of the American Dental Association, as well as many other representatives of American dentistry.

The Kellogg Foundation at the University of Michigan, recognizing the exceptional caliber of the personnel composing the delegation, offered a two months' scholarship to each, eleven of whom accepted. This exceptional opportunity for further scientific study was an especially fitting climax to the visit of our friends.

The American association sponsored the first International orthodontic congress, which was held in New York City in 1926. This association was also a large contributing factor in the second congress, held in London in 1931, but its members are cognizant of the fact that this, the first inter-American congress, surpasses the other two congresses in benefits to be derived from the interchange of thoughts among the representatives of the dental profession of the world. To the cultural relations division of our state department and to the office of the coordinator of inter-American affairs, we owe a lasting debt of gratitude, as we realize that a great portion of this success should be attributed to their invaluable advice, cooperation and generous assistance at all times.

The American Association of Orthodontists wishes to acknowledge the very cooperative spirit of Oren A. Oliver, President of the American Dental Association, and Daniel F. Lynch, chairman of the Pan-American Relations Committee.

Besides those already mentioned, the work of the Congress was greatly aided by: John W. Ross, chairman of the Inter-Relations Committee, Andrew F. Jackson, chairman of the Reception Committee, and A. C. Broussard, chairman of the Local Arrangements Committee.

MEXICAN ORTHODONTIC SOCIETY

THE new officers of the Asociación Mexicana de Ortodoncia, are: president, Samuel Fastlicht; secretary, Guillermo S. Gamboa; treasurer, Emilio Berea Fabela.

We will appreciate very much if you are kind enough to publish this note in this important journal.

Thanking you in advance for your kindness, I am

Yours very truly,
The Secretary,
DR. GUILLERMO S. GAMBOA.

PRIZE ESSAY CONTEST

THE Research Committee of the American Association of Orthodontists has been empowered by the board of directors to conduct a prize essay contest. The prize, $200, will be offered annually until further notice. The terms of the competition are as follows:

Eligibility.—Any student enrolled in a recognized university, or any person who has completed his formal education in orthodontia not more than three years before January 1, 1943, is eligible to compete for the prize.

Essay.—The essay must represent a piece of original research having a direct bearing on the field of orthodontia. It may relate to either a biologic or a clinical problem and may represent material that has been offered in partial fulfilment of the requirements of a graduate or postgraduate degree, or any graduate, postgraduate or undergraduate contest. No previously published essay will be accepted. All essays must be in the hands of the committee by January 31, 1943. If no essay is deemed worthy by the committee, the prize will be withheld.

Award.—The prize-winning essay will be accorded a place on the scientific program of the annual meeting of the association, at which time the prize will be awarded. The association will retain publication rights on the first three choices.

For further information, address

ALLAN G. BRODIE, *Chairman*
Research Committee, A. A. O.
30 North Michigan Ave.
Chicago, Ill.

RESEARCH SECTION, AMERICAN ASSOCIATION OF ORTHODONTISTS

AT the present time, there is no opportunity afforded men interested in orthodontic research to meet together and discuss their problems. At the last meeting of the American Association of Orthodontists, it was proposed that the Research Committee be empowered to arrange a portion of the program for the next annual meeting.

The program will consume one-half day and will be restricted to ten or fifteen minute reports by men actively engaged in research in orthodontia or in its allied fields. Time will be allowed for discussion of all presentations, in order that the greatest benefit may accrue to those participating. All institutions and all individuals are invited to request time.

For further information, or time reservations on the program, address

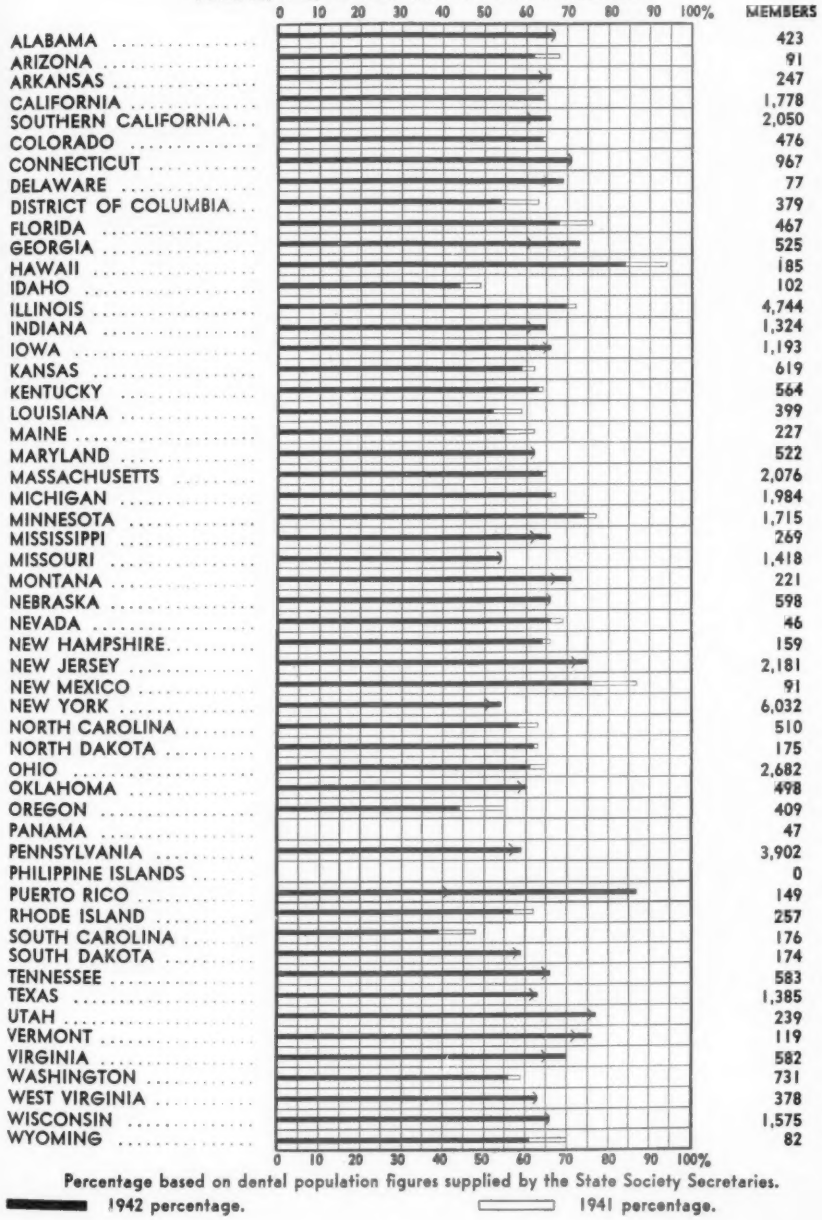
ALLAN G. BRODIE, *Chairman*
Research Committee, A. A. O.
30 North Michigan Ave.
Chicago, Ill.

ATLAS OF DENTAL AND ORAL PATHOLOGY

THE second edition of the Atlas of Dental and Oral Pathology will be ready for distribution July 20. The Atlas is prepared by the Army Medical Museum from cases recorded in the Registry of Dental and Oral Pathology of the American Dental Association, and is distributed by the Association. The price of the second edition will be $5 per copy. Copies can be procured from the American Dental Association, 212 East Superior St., Chicago, Ill.

Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF JUNE 30, 1942, AS COMPARED TO 1941 MEMBERSHIP



Percentage based on dental population figures supplied by the State Society Secretaries.

1942 percentage. 1941 percentage.

OBITUARY

WILLIAM ERNEST CUMMER, D.D.S., C.S.B.

(1879-1942)

THE sudden death, May 14, of William Ernest Cummer, C.S.B., D.D.S., at the comparatively early age of 63, has robbed the dental profession of a true friend—one who served well the interests of dentistry in many capacities, through the years from 1902 until his death.

Born in Hamilton, Ontario, in 1879 he attended the elementary and secondary schools of that city, and later graduated from the Royal College of Dental Surgeons of Ontario and the University of Toronto. Subsequently, he was appointed to the chair of prosthetic dentistry at his alma mater and served in this capacity until he became dean of the dental faculty of the University of Detroit. At the very height of his dental career and in the full vigor of his scholarship, he resigned his deanship, in 1931, and applied for admission to the Basilian novitiate. He was ordained in the order in 1938.

From the very outset of his professional career, Ernie Cummer, as he was affectionately designated by his friends, made his mark as a keen student. By his example and his genial and sympathetic understanding, he endeared himself to all his associates, both within and outside the dental profession. He was particularly helpful to earnest undergraduates and to those taking postgraduate courses, many of whom, because of his help, were destined to play an important part in their chosen profession. Dental students of earlier years will remember his readiness to help and his many acts of kindness, so unostentatiously rendered. In all his relations with the members of the dental profession, Dr. Cummer displayed an exquisite politeness that was never found wanting and never failed to make lasting friendships. He gave unstintingly of his energies when helping others.

Whenever Dr. Cummer accepted an appointment, whether it had to do with his professional activities, musical societies or religious organizations—no matter what its nature—he devoted his entire energy, without reservation to the task in hand and brought it to a successful issue. This is reflected in his writings, which are rightly considered classics in the realm of prosthetic publications. From 1917 to 1931, Dr. Cummer was associate editor of *Oral Health*.

Early in his dental career, Dr. Cummer demonstrated an unusual capacity for teaching and research, to which all who had the privilege of serving under him can bear grateful tribute. He was a natural philosopher with a remarkably clear conception of the scientific method. His many contributions to dental science are basic. With him, responsibility, such as is imposed because of the possession of a superior intellectual equipment, was never separated from a sense of the privilege of serving mankind. His extensive knowledge of restorative appliances to be used in cases of facial bone injuries was used to good purpose in the World War, in which he served as major in the Dental Corps.

Sensing the importance of having all dental undergraduates learn the properties of the materials used in restorative procedures, Dr. Cummer was instrumental in having such a course established as complementary to the usual instruction given in the departments of prosthodontia, orthodontia and operative dentistry. This course was very satisfactory from its inception, and most dental schools, recognizing its value, have included similar instruction in their curriculums.

Dr. Cummer was also a pioneer in establishing a predental course as part of the regular training of dental students. He devised a series of projects based upon the various types of skill required in practicing dentistry. In this way, a marked advantages of such a training have been fully demonstrated in the facility with which students attack the mechanics of various procedures confronting them in the advanced subjects of the dental curriculum. Dr. Cummer

W. E. CUMMER, D.D.S., C.S.B.
1879-1942

student's aptitude for the work was clearly demonstrated and, in most instances, vastly improved. In addition, many pieces of apparatus useful in dental technology were constructed. The was, throughout his entire dental career, fully cognizant of the importance of the contributions made by the science of engineering to the successful conduct of dentistry, and, to this end, students were

taught fundamental engineering principles, and so became proficient in draughtmanship and designing. Much of the research done by his students bore the imprint of such training.

Dr. Cummer's chief claim to recognition in the field of dentistry was perhaps his work in partial denture construction. Even today, ten years after he terminated his dental career to take on religious responsibilities, Dr. Cummer, as a survey of dental literature will show, is probably the most frequently and most widely quoted authority on partial denture prosthesis. In many of the recent publications on this subject, large sections are devoted to a review of the pioneer work done by him. No finer tribute can be paid to any scientist. At the height of his career, Dr. Cummer gave hundreds of clinics and lectures to dentists in most of the principal cities of Canada and the United States. More recently, even though busily engaged with religious duties, he maintained contact with dental affairs and was, at the time of his death, compiling a treatise for teachers of prosthodontia. His sound judgment and broad vision were of great value in all matters concerning dental pedagogic methods.

In his practical work, his research and even his hobbies and pastimes, Dr. Cummer exhibited an astounding versatility of interests. The range of his accomplishments was most unusual. He actually combined the knowledge and skill of a number of vocations. He was an accomplished artist, musician, designer, inventor, draughtsman, engineer and scientist. To which imposing array must be added unusual talents as a teacher and a dentist. Work was always his greatest interest. Nothing was allowed to interfere with his sense of duty.

If strength is viewed as a moral quality, he may be described as an unusually strong man. And for this reason: One of the most obvious factors in such strength is the concentration of energy with a view to accomplishing some objective. It is seen at its best in devout Christians, for true religion is actually a challenge to the strong. It is a stimulus rather than a sedative. It sounds a vigorous note of challenge to all recruits. It supplies the loftiest code of conduct for its followers. It satisfies all spiritual and intellectual needs of the devout. It furnishes that unity of creed and life that all would enjoy. It brings profound comfort, happiness and peace of mind to those who obey its commandments. Religion is not alone for the weak, the suffering and the unsuccessful, it is for the strong and energetic. Dr. Cummer was one of these. In these times, when it is customary to become absorbed in possessions and interests, it is refreshing to find that Dr. Cummer had a sense of that unusual kind of responsibility that is the distinguishing characteristic of the Christian view of life. To him, religion was what one makes of personal relationships. It implied certain claims and responsibilities which are inseparable from the everyday problems of a useful and purposeful life.

His long and useful life was not, in any sense, restricted to any one calling. His unbounded energy found fruitful expression in many enterprises. And the world is the better because he lived and worked. Respected for his unquestioned integrity by all who knew him, Dr. Cummer was an outstanding citizen, a faithful and devoted student of the humanities, a clever and sympathetic teacher, an expert technician, and a skilful operator. His cheerful personality will be greatly missed by his friends and associates.

DEATHS

BEYER, CHRISTIAN P., Waverly, Iowa; State University of Iowa, 1888; died April 30; aged 78.

BOTTENHORN, IRWIN A., Columbus, Ohio; Ohio State University College of Dentistry, 1906; died April 18; aged 59.

CRAWFORD, HARRY M., Lima, Ohio; Ohio College of Dental Surgery, 1907; died January 2; aged 64.

DIMOND, ANDREW, Lima, Ohio; Chicago College of Dental Surgery, 1905; died June 10.

GATES, W. W., Indianapolis, Ind.; Indiana University School of Dentistry, 1899; died June 8; aged 78.

GROVE, CARL J., St. Paul, Minn.; Chicago College of Dental Surgery, 1898; died July 4.

HAYES, HAROLD H., Chicago, Ill.; Chicago College of Dental Surgery, 1897; died April 7.

HENDERSON, JOHN M., Columbus, Ohio; died June 30; aged 72.

JANKANS, WILBUR G., Fort Dodge, Iowa; died March 26; aged 72.

JOHNSON, GEORGE E., Fort Wayne, Ind.; Philadelphia Dental College, 1890; died June 5; aged 84.

KELLER, LOUIS A., Tiffin, Ohio; Cleveland University Dental Department, 1895; died April 11; aged 71.

KEMPER, RALPH K., Dayton, Ohio; Ohio College of Dental Surgery, 1903; died May 20; aged 65.

KIHORNY, EMIL L., Cleveland, Ohio; Western Reserve University School of Dentistry, 1914; died January 9; aged 52.

KNECHT, FREDERICK, Chicago, Ill.; Northwestern University Dental School, 1905; died June 27; aged 72.

KOHLER, MILTON W., Fairport, N. Y.; University of Buffalo School of Dentistry, 1905; died May 24; aged 64.

KRAEMER, FREDERICK O., Brooklyn, N. Y.; New York College of Dentistry, 1883; died June 20.

MCLAUGHLIN, HUGH I., Cleveland, Ohio; Western Reserve University School of Dentistry, 1916; died July 1; aged 58.

MALONEY, JOHN JOSEPH, Rock Rapids, Iowa; Northwestern University Dental School, 1902; died April 15; aged 68.

MATHESON, GEORGE A., Des Moines, Iowa; Northwestern University Dental School, 1902; died April 6; aged 65.

RIZER, GUSTAVUS E., Fort Madison, Iowa; State University of Iowa College of Dentistry, 1897; died April 13; aged 71.

SEELEY, FRANKLIN N., Toledo, Ohio; Ohio College of Dental Surgery, 1890; died June 21; aged 74.

SHERWOOD, CLYDE C., Toledo, Ohio; Ohio Medical University, College of Dentistry, 1901; died July 5; aged 66.

TAYLOR, ELMER E., University of Illinois College of Dentistry, 1906; died June 20; aged 63.

THATCHER, JOSEPH E., Bellefontaine, Ohio; Chicago College of Dental Surgery, 1899; died June 30; aged 73.

WALTER, JOHN A., McGregor, Iowa; died April 27; aged 81.

WIEGERING, WILLIAM P., West Palm Beach, Fla.; University of Pittsburgh, School of Dentistry, 1902; died January 14; aged 71.

WRIGHT, CHARLES D., Hillsboro, Ohio; Ohio College of Dental Surgery, 1905; died June 5; aged 64.

ZIMMERMANN, EDWARD A., Chicago, Ill.; Northwestern University Dental School, 1917; died February 14; aged 48.

QUESTIONS AND ANSWERS

The answers here published have been prepared by authorities, but do not represent the opinion of the American Dental Association as an organization or of any other official bodies unless specifically stated in the reply.

ACUTE PERICEMENTITIS

To the Editors: I have a case of what I call acute pericementitis about two lower adjacent molars in the mouth of a man, aged 53, whose teeth have had better than average care. Acute swelling developed, extending into the facial tissues, with pockets extending from the gingival margin to the apices of the roots of both teeth.

Both teeth are or were apparently vital, neither having a cavity, filling or other defect, and there seems to be every indication that the infection developed not at the gingival margin, but somewhere in the deep supporting tissues.

I make this statement because I have given this patient prophylactic treatment at fairly regular intervals and feel certain there was no discernible pocket or break in continuity of the tissues, except some recession of gum tissue lingually, four months ago.

I would very much appreciate a reply stating what this description suggests to you as to cause, prognosis for other teeth and treatment.

C. M. RICHMOND, D.M.D.,
St. Johnsbury, Vt.

ANSWER

It seems probable that the acute swelling was caused by a "lateral" or periodontal abscess, resulting from an acute infection in a preexisting deep pocket. Often, because a gingival pocket is narrow and deep, when it becomes acutely infected drainage is so inadequate that the adjacent tissues are quickly involved. Treatment consists of local irrigations with a mild antiseptic, such as an iodosaline solution, and then eradication of the pocket, or extraction of the tooth. Prognosis for the teeth so involved is poor, for lateral abscesses often recur.

Occasionally, acute swelling develops around vital teeth, following careless instrumentation with prophylactic instruments. Forcing calculus deep into the gingival tissues may cause a severe local infection. This is limited, however, to the gingival tissues, and does not result in pocket formation unless an osteomyelitis results with sloughing of the alveolar bone. M. K. H.

ARTIFICIAL PROTRUSION

To the Editor: The patient has been wearing his present full dentures about four years. He has a habit of holding the dentures in an exaggerated protrusive occlusion, often as much as five-eighths inch, especially when writing. The occlusal surfaces are almost flat and the molars occlude first when the mandible is retruded in what is probably centric jaw relation. What is the cause of this condition and how may it be corrected?

ANSWER

Although some patients have, or acquire, certain habits not necessarily caused by the presence of artificial dentures, I am inclined to believe that the condition described is directly related to the patient's artificial dentures, especially in their present environment. The fact that the molars occlude prematurely when the jaws are closed in centric relation would probably cause the patient to protrude the denture sufficiently to bring the other teeth in contact. Occlusion might not be the only factor, since the fit of the denture bases, the relation of the occlusal plane to the ridges and the vertical dimension might also influence this condition.

It is my opinion that new dentures should be constructed. After accurate impressions have been made, the casts should be properly related in an adjustable articulator by means of a facebow, and the centric jaw relation must be recorded on the patient. If the esthetic requirements and the rest space permit, it would be desirable to accept a vertical

dimension at which the crests of the upper and lower ridges (as viewed buccally) are parallel. The condyle elements of the articulator should then be adjusted from records made in the mouth. After the anterior teeth have been arranged, the posterior teeth should be alined to extend the occlusal plane distally parallel to the ridge crests. An unlocked balanced occlusion should be provided in centric and eccentric jaw relations.

Anatomic type posterior teeth in their original form present a locked centric occlusion and should be altered by grinding and by fusing more porcelain into their deep central sulci and grooves. A locked occlusion does not hold the jaws in definite relation to each other. It does, however, cause unnecessary trauma and ridge resorption.

If the patient is not comfortable after a reasonable time with properly constructed new dentures, I would provide him with flat occlusal surfaces with balanced centric occlusion in the jaw relation which seems most comfortable.

Cooperation of the patient in overcoming the protrusion habit will be essential to a successful end-result.

L. G. JORDAN.

DENTURE FOR A CHILD

To the Editor: Perhaps you can render some assistance or information with regard to the following case. A short time ago, I had occasion to extract all the upper deciduous teeth for a child 3 years old. The teeth, through apparent mineral deficiency, had decayed completely. The parent has made inquiries as to an upper denture for the child. It is natural to suppose that some masticatory apparatus is necessary to carry the child through the period before the second dentition.

Do you know of any dental records of construction of an upper denture for a child so young? If so, with what degree of success, and what was the procedure recommended for handling such a case?

N. P. CHANAUD, D.D.S.,
Centreville, Md.

ANSWER

While I have had only one case in which I supplied a full upper denture for a child as young as 3 years and 5 months, I have supplied a number of child patients from 4 years up with both upper and lower partial dentures that have proved very satisfactory.

In the case of Dr. Chanaud's patient, I suggest first making a vulcanite plate, without teeth, giving the same careful consideration to the mouth tissues that would be given to the construction of a denture for an adult. In the waxing procedure, the case should be mounted on an articulator and a shallow groove carved for the lower teeth to occlude with in function.

Through correspondence with Dr. Chanaud, I learn that the lower first and second deciduous molars are carious. The preservation of these teeth is important.

A similar vulcanite plate should be constructed in the course of a few months to open the bite a little more than the first one. This plate should not cover the labial gum tissue in the area from cuspid to cuspid. If worn successfully, this plate should be cut back from time to time until the buccal surface of the ridge is exposed as far as the second deciduous molar area.

At the time of making the third plate, the smallest size diatoric teeth should be selected and these should be ground to a satisfactory size. To keep pace with changes incident to growth, it will probably be necessary to construct a new denture about every three months.

One of the commercial adhesive powders may be selected, if necessary, to aid the patient in keeping the plate in place. Such an adhesive powder should be used sparingly, and not at all when it can be avoided.

It is surprising how cooperative and appreciative the painstaking dentist will find many of these young patients.

R. C. WILLETT.

INCIDENTS OF PRACTICE

Stammering and Nervous Muscular Condition Cured by Surgical Measures

By Charles E. Worth, D.D.S., Indianapolis, Ind.

A boy, aged 11½, seen September 27, 1941, stammered so that he could be understood only after repeating several times. He had a nervous muscular twitching and jerking, which was continuous, persisting even in sleep. At the time of his birth, his mother was 40 and his father 50 years old. The patient had lived in the country most of his life. He weighed 107 pounds. His diet was well varied, consisting of vegetables, meats, fruits and milk. He had had cod liver oil from birth until 10 years of age. He was usually well and had had no bowel trouble.

His sleep was restless, with nervous twitching. With his stammering was a very nervous condition. He could not control the muscular contractions, and he showed a good deal of temper.

As a young child, the patient had had a good disposition. He talked early and rapidly. He could sing and carry a tune, although with nervous twitching and jerking. He would become angry because he could not talk without stammering. The condition developed at about 4 years. By the age of 7, it was decidedly worse. The boy lost weight rapidly and progressively. He was in the sixth grade at school. Living in the country, he did not associate much with other children, but played some with them, baseball, football and children's games. He always tired easily. At the age of 6, he fell, remaining unconscious for ten or fifteen minutes. He was slightly worse after the fall. He had been left handed, but his first school teacher taught him to use his right hand.

His mother brought him to the school for stammerers, in Indianapolis, on the advice of their physician. After nearly a month's treatment, the condition was growing worse, and the patient's mother was advised to consult a chiropractor, which she did. He advised her to see a dentist. A full-mouth x-ray examination revealed nine impacted teeth: the lower left cuspid, under the central and lateral incisors, labially and lingually, and the second and third molars, right and left upper and lower, none fully developed and so locked that none could erupt.

October 1, in hospital, the lower left three molars and upper second molar were removed. The lower two molars erupted in a few days. Immediately, great improvement in talking, with less nervousness, was evident. October 9, the lower right third molar and upper second molar were removed, and again the second molar erupted in a few days.

October 21, the cuspid was removed. By that time, the patient was entirely free of twitching and jerking and could talk so that he could be understood with ease. The family returned home, to Montana, November 8, with the boy so improved that they were very happy.

I quote from a letter received from the patient's mother December 18: "Raymond is fine; going to school every day. Has gained 10 pounds in weight. He still hesitates a little when he talks, but is improving right along. Our dentist is very much interested in Raymond's operation and marvels at the change in his health."

Dr. Sidney Field assisted in all three operations.

Bankers Trust Building.

Broken Sewing Needle in a Root Canal

By Irwin Walter Scopp, B.S., D.D.S., New York, N. Y.

A girl, aged 21, a refugee, had had the root canal of a lateral incisor treated in Germany. Her hasty departure from the

continent precluded her having the work properly completed. For more than a year thereafter, she daily heated a sewing needle and inserted it in the canal, and removed as much débris and putrified food material as possible. She experienced no pain during this time.

This self treatment continued successfully, she stated, until, one day, she had difficulty in removing the needle. Applying a little too much force caused the needle to break, a piece half a centimeter in length remaining in the canal. It was no longer possible to pass anything into the canal with the passage thus blocked. The tooth subsequently began to ache.

A roentgenogram revealed the broken needle and much periapical destruction. An effort was made to enter the canal, but the presence of the metal, which undoubtedly was very firmly entrenched, prevented it.

The tooth was extracted. Later it was sliced with a disk and a disintegrated and corroded piece of metal, presumably the broken end of the needle, was found.

240 East One Hundred Seventy-Fifth Street.

Fused Lower Incisors

By HERBERT ELY WILLIAMS, D.D.S., Red Bank, N. J.

A CASE of fusion of two lower incisors is not submitted to call attention to the value of the roentgen rays or as an example of freak dentition, two or three others of similar character having crossed my office sill since 1897. The peculiar circumstance was the patient's absolute unawareness of the fusion of the two teeth.

Anomalies of Eruption

By THEODORE KATZ, D.D.S., Bronx, N. Y.

A MAN, aged 29, had two bicuspids missing on the upper right side, with no history of extraction. The upper right permanent lateral incisor was also absent, the partially resorbed deciduous lateral incisor being *in situ*. (Fig. 1.) On the lower right side, the partially resorbed second deciduous molar remained, with no evidence of a permanent second bicuspid. In this tooth, there was evidence of infection. (Fig. 2.) The x-rays revealed also a peg-shaped upper left third molar. (Fig. 3.)

Fig. 1.—Absence of upper bicuspids and lateral incisor.

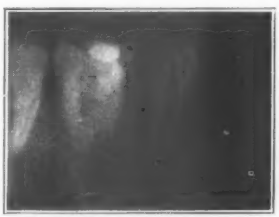


Fig. 2.—Absence of lower second bicuspid.

Fig. 3.—Peg-shaped upper third molar.

Unerupted Permanent and Supernumerary Teeth

By J. E. PACKARD, D.D.S., Sioux City, Iowa.

A WHITE woman, aged 28, in good health and above average in appearance, had had the deciduous teeth extracted at the age of 16. She had worn a full upper denture since that time. The alveolar ridges were rather irregular, and wider than usual, as shown in the illustration. The soft tissue was firm and healthy in appearance. In the maxillae, none of the teeth extruded through the gum tissue. In the mandible, the six anterior teeth, a bicuspid and the first molar on the right side had erupted. The patient did not wear a partial lower denture. As shown in the roentgenogram (Fig. 1.), there was little loss of alveolar bone throughout the mouth.

Frances Building.

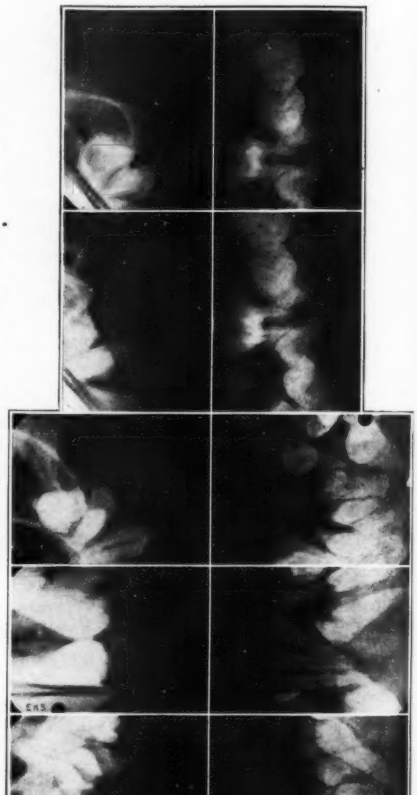


Fig. 1. (Packard).—Unerupted and supernumerary teeth.

Fractured Tooth

By MICHAEL FRIEDMAN, D.D.S., Newburgh, N. Y.

A MAN, white, aged 65, had an upper right first bicuspid with a crack which was in the longitudinal axis extending mesiodistally and therefore did not show in the x-ray film. The x-ray film did reveal that the apical tips were fractured horizontally. Close observation of the film reveals the apical tip of the palatal root extending about an eighth inch beyond the buccal tip. Incidentally, the patient said the tooth was fractured in eating hard bread.

Fractured upper right first bicuspid.

Broadway and Chambers Street.

CURRENT LITERATURE

Glandular Fever (Infectious Mononucleosis)

By J. Smeall

Infectious mononucleosis, which should be included in all differential diagnosis of swellings in the cervical region, is found in temperate zones sporadically or in epidemic form and is confined largely to the young, especially in schools and institutions. It has been attributed to many organisms, of which the Vincent organism is one. The current opinion, however, favors a virus infection. The diagnosis is based on the combined clinical, hematologic and serologic pictures. Following a two week incubation period is an onset of fever, headache, pain in the neck and adenitis of the glands, especially the cervical. The blood picture shows a lymphocytosis with large numbers of abnormal mononuclear cells. The serum shows an increase in agglutinins for sheep erythrocytes.—*Edinburgh M. J.*, 49:291, May 1942.

C. Resevick.

The Dietitian as a Teacher of Dental Students

By R. F. White

The nutrition department of the Forsyth Dental Infirmary gives members of its intern staff special opportunities to apply their knowledge of the physiology and biochemistry of nutrition. The nutrition program is carried on partially through classes which are held four mornings each week. Research activities concerning topics closely related to nutrition are discussed by visiting lecturers. The nutritionist emphasizes the practical significance of this research as applied to dental patients. Every attempt is made to arouse interest and to stimulate the interns to undertake original work. In the clinic, medical-nutritional supervision of individual patients is maintained by means of periodic conferences with mother and child. By the use of illustrative material, simple reporting systems and teaching devices, many children can be instructed effectively.—*J. A. Dietet. A.*, 18:379, June 1942.

David S. K. Dai.

Repair of Cleft Palate by Tube Graft

By H. P. Pickerill

Tube grafts are exceedingly useful in certain palatal restorations. The author first performed this operation on an edentulous soldier who had had the anterior part of his hard palate shot away, and upon another soldier who had lost a portion of both the hard and the soft palate. Numerous cases in children with very wide clefts have been treated in this manner. All the results were favorable.—*Brit. M. J.*, 2:680, May 30, 1942.

David S. K. Dai.

Edema of the Glottis Complicating Measles

By J. H. Mulvany

In 950 cases of measles, eight cases of edema of the glottis occurred. Of these eight cases, six terminated fatally. Tracheotomy was necessary in one of the two surviving patients. Ten similar incidents were reported simultaneously in other parts of the country. The differentiation between edema of the glottis complicating measles and laryngeal diphtheria, with which it may be confused, can be made by palpating the swollen epiglottis and aryepiglottis folds present in the former. Symptoms of diphtheria will generally be absent.—*Brit. M. J.*, 2:638, May 23, 1942.

David S. K. Dai.

Sensitization of Rabbits by Intradermal Injection of Heat-Killed Lactobacilli of Human Oral Origin

By N. B. Williams and R. W. Harrison

Experiments by means of the skin sensitization test were carried out to determine whether more than one species of lactobacillus exists in the mouth. Five strains of oral lactobacilli were isolated from clinic patients and a vaccine was prepared from each

strain. Two rabbits receiving one injection per week were sensitized with each vaccine by the intradermal method for a period of seven weeks. Purified carbohydrate extracts were also made from the bacterial strains and these were used in the hypersensitivity tests. The results showed that repeated injections of the vaccine intradermally elicited a hypersensitivity, which was delayed in action, but progressive through the sixth inoculation. This was likewise true of the carbohydrate reaction. Type specific precipitins were not demonstrated in the sera of the sensitized animals, this indicating that specific strains are not yet available.—*J. D. Res.*, **21**:223, April 1942.

C. RESEVICK.

A Bacteriologic Check on Residual Dental Infection

By M. MURRAY and E. O'FERRELL

ON edentulous patients showing constitutional signs of chronic infection, in whom all possible foci except the alveolar bone had been eliminated, the x-ray examination of the alveolar ridges revealed no gross destruction, but did reveal a slight irregularity or furriness of the alveolar process. After sterilization of the outer alveolar surface, a sterile saline solution was injected and then withdrawn from these areas. In all cases of alveolar furriness, streptococci were recovered. Control tests of patients presenting smooth alveolar ridges proved negative. This would indicate that the removal of infected teeth does not insure the eradication of a focus of infection.—*J. Lab. & Clin. Med.*, **27**:1154, June 1942.

C. RESEVICK.

A Study of the Development of Dental Enamel in Dogs

By G. E. GLOCK, HELEN MELLANBY, MAY MELLANBY, M. M. MURRAY and J. THEWLIS

ON an investigation of the stages of enamel development in the dog with reference to sound and defective enamel, the investigators employed histologic, chemical and x-ray analyses to evaluate the effects of regulated diets. The quantitative results of the chemical and x-ray analyses indicate that the hardness of the enamel can be attributed to the concentration of the minerals present. The same figures show that the calcification of the enamel matrix begins at the tip of the cusp and goes downward. The chemical results show that the addition of cod liver oil to the diet increases calcification of enamel to a greater extent than the use of peanut oil, which is deficient in vitamins A and D. The addition of large amounts of vitamin D and A resulted in less calcification than the control diets, while the separate use of these vitamins caused an increase in enamel calcification. No conclusion was drawn from the latter observations.—*J. D. Res.*, **21**: 183, April 1942.

C. RESEVICK.

Studies on the Antibacterial Factors of Human Saliva

By M. VAN KESTEREN, B. G. BIBBY and G. P. BERRY

THE antibacterial activities of saliva were tested on fifteen species of bacteria with culture media suitable for the particular organisms employed. An antibacterial effect was demonstrated by the occurrence of a colony-free zone around the well containing the test saliva. Variations of more than 1 mm. in zone were interpreted as indicating differences in antibacterial power. Saliva was shown to exert antibacterial effects on a wide variety of organisms.

The effects on saliva of heating, ultraviolet irradiation, storage, freezing and thawing, filtration, adsorption and addition of chemicals suggest that saliva contains at least two antibacterial principles. One of these resembles lysozyme; the other is apparently distinct from it.—*J. Bact.*, **43**:573, May 1942.

PETER P. DALE.

Histochemical Studies of Phosphatase Distribution in Developing Teeth of Albino Rats

By M. B. ENGEL and W. FURUTA

PHOSPHATASE activity and localization in developing tooth germs of rats 1 and 4 days old were studied and correlated with the degree of cellular differentiation and the calcification process. The enzyme was shown to be localized in the stratum intermedium and the outer enamel epithelium of the incisors. It was present, but to a lesser extent, in the stellate reticulum of the first molar, in advanced stages of development, and in the pulp contiguous to those odontoblasts in the regions of dentin calcification. No phos-

phatase activity was demonstrated in the ameloblasts or odontoblasts. However, there was extensive phosphatase activity in the connective tissue surrounding the crypt bone. —*Proc. Soc. Exper. Biol. & Med.*, 50:5, May 1942.

V. H. POWELL.

The Incidence and Treatment of "Gingivitis"

By H. C. CAMPBELL and R. P. COOK

DURING a period of one year, oral examination of 2,924 new patients admitted to the Dundee Dental Hospital revealed sixty-five cases of gingivitis, fifty-nine of which were simple forms and six the ulcerative type. In the simple gingivitis, the gums are sore and bleed on pressure. There is but slight production of pus, and the micro-organisms are of mixed type. These cases heal very early with massive doses of ascorbic acid and scaling of the teeth. In the ulcerative type, the pain and bleeding are more intense, the lymph glands become enlarged and there is marked production of pus which has a characteristic fetid odor. The treatment for the ulcerative type is the same except for local application of (1) chromium trioxide and hydrogen peroxide or (2) magnesium sulfate paste.—*Brit. D. J.*, 72:213, May 1, 1942.

V. H. POWELL.

Incidence of Mottled Teeth

By L. SPINA

One of the signs of chronic fluorine poisoning (fluorosis) is mottling of teeth. An examination of 5,019 men and women showed definite mottling of the teeth in 21.9 per cent. In this survey, there were almost twice as many men as women examined, but the percentage of mottled teeth was practically the same in the two groups. It was also noted that the women were much more careful regarding oral hygiene than the men were. The distribution of mottled teeth is analyzed according to the counties from which those examined come. Of those living in the London area, 23 per cent were affected. The highest percentage (85) occurred in persons from Hertfordshire and Northhampton.—*Lancet*, 1:649, May 30, 1942.

V. H. POWELL.

An Investigation into the Influence of Synthetic Vitamin C as a Controlling Factor in the Incidence of Dental Caries in Already Calcified Teeth

By W. B. GRANDISON, L. B. SCOTT and D. B. CRUICKSHANK

THE daily administration of 200 mg. of synthetic vitamin C to twenty children over a period of two years resulted in no observable improvement in the dental condition. The added vitamin C intake did, however, improve the general health. This negative finding does not argue against the possible beneficial action of vitamin C on tooth structure during the formative period.—*Brit. D. J.*, 72:237, May 15, 1942.

V. H. POWELL.

Tooth Eruption: The Axial Movement of Continuously Growing Teeth

By HANS SICHER

THE axial movement of a continuously growing tooth is the expression of its longitudinal growth. It is believed that the leading factor in this directed growth is the elongation of the pulp. The pulp grows in a proliferation ring at its basal end, and this ring is separated from the periapical tissue by an infolding of Hertwig's epithelial sheath which forms the epithelial diaphragm. The pulpal growth is normally simultaneous and equal to the elongation of Hertwig's sheath. The author stated that a "hammock" ligament on which the basal end of the tooth rests acts to direct the growth of the tooth. Continuous changes in the suspensory ligament of the tooth, stimulated by the expansion of the pulp, are an integral part of the complicated process of eruption. These changes take place in the intermediate layer of the peridental membrane, and this layer is made up of a plexus of precollagenous fibers.—*J. D. Res.*, 21:201, April 1942.

JAMES T. GINN.

Correlation of Chemical and Histologic Investigations on Developing Enamel

By J. P. WEINMANN, G. D. WESSINGER and G. REED

CHEMICAL analyses of various sections of enamel, obtained from an unerupted molar of a pig, were made for moisture, organic material and total calcium and phosphorus.

Histologic sections were prepared from the corresponding tooth on the opposite side of the jaw. By correlating the chemical analysis with the histologic structure of developing enamel, the main chemical components of the two stages in enamel development, i.e. matrix formation and calcification, were observed. It was found that the insoluble enamel matrix contains 37-28 per cent water, 38-32 organic material, 23.4-30.3 calcium and 12-15.3 phosphorus. In contrast, the soluble enamel percentage values were found to range between 25 and 6.5 water, 9.5 and 4.0 organic material, 34.6 and 37.6 calcium and 26.5 and 18.1 phosphorus. The chemical properties of insoluble and soluble enamel suggest a distinct differentiation between the stages of enamel formation and enamel calcification, the latter stage starting only after the first has been completed. It is suggested that calcification of the enamel is characterized by a removal of moisture and organic material and an influx of mineral salts.—*J. D. Res.*, 21:171, April 1942.

JAMES T. GINN.

Ludwig's Angina

By M. TAFFEL and S. C. HARVEY

FORTY-FIVE cases of Ludwig's angina treated over a period of nineteen years included thirty in males and fifteen in females varying in age from 5 to 67 years. Only those infectious processes located in the areas between the mylohyoid and geniohyoid or between the geniohyoid and the genioglossus muscles were considered, regardless of the etiology, point of origin or pathway of the infection. The cardinal symptoms appeared early and were easily recognized. They included (1) a tender swelling in the submandibular area of the neck, (2) elevation of the tongue and (3) edema of the floor of the mouth. The usual high mortality in this disease is due not to some overpowering virulence of the infecting organisms, but more often to a mechanical obstruction of the respiratory pathway. For this reason, the condition is a surgical emergency, demanding immediate operation. The primary object of the operation is to relieve and preferably prevent this obstruction by releasing the tension within the submandibular space. This was accomplished with safety and certainty, only by complete transection of the deep cervical fascia and the mylohyoid muscle. Except in three cases, the operation was performed under local procaine anesthesia. Only two deaths occurred, at least one and probably both of which were not caused by the angina.—*Surgery*, 11:841, June 1942.

J. E. GILDA.

Experience with Various Methods of Skeletal Fixation in Fractures of the Jaws

By R. MOWLEM

VARIOUS methods of immobilization for maxillary and mandibular fractures are discussed and illustrated. The author advocates the use of splints and pins placed externally, to obtain traction and immobilization of the loose segments.—*Proc. Roy. Soc. Med.*, 25: 415, April 1942.

C. RESEVICK.

Relationship Between Dietary Deficiency and the Occurrence of Papillary Atrophy of the Tongue and Oral Leukoplakia

By J. C. ABELS, P. E. REKERS, H. MARTIN and C. P. RHOADS

THE experimental group consisted of seventeen adults, six men and eleven women, with papillary atrophy of the tongue which affected from all to one-fourth of all the organ surface; twenty-nine adults (twenty-four men and five women) with leukoplakia of the tongue, buccal mucosal gingivae or inner surfaces of the lips, and twenty-one patients (thirteen male and eight female) having both papillary atrophy of the tongue and leukoplakia of the mouth. A control group of (1) twenty-five normal adults, (2) twenty women with cancer of the breast, (3) twelve men and thirteen women with cancer of the stomach and (4) ten men and five women with leukemia were studied only to ascertain the incidence among them of syphilis, excessive smoking and a history of dietary deficiency.

The conditions responsible for the production of papillary atrophy of the tongue and of oral leukoplakia were investigated, as well as the anatomic and physiologic changes associated with the oral lesions. The results of administration of large amounts of yeast were studied.

The incidence of dietary deficiency and the excessive use of tobacco were found to

be high in patients with papillary atrophy of the tongue and oral leukoplakia, and with combinations of these lesions. The incidence of syphilis was not abnormally high. In many patients studied, the incidence of simple dietary deficiency was confirmed by the finding of low plasma levels of vitamin A and low urinary excretion of riboflavin. The pathologic changes associated with papillary atrophy of the tongue and oral leukoplakia were hepatic dysfunction, anatomic and functional abnormalities of the gastro-intestinal tract, anemia, nail deformities, cheiloses and petechiae. Hepatic dysfunction and abnormalities of the gastro-intestinal tract were considered to be possible factors in a dietary deficiency. The administration of large quantities of brewer's yeast (60 to 120 gm. per day) was followed occasionally by a complete or partial remission of papillary atrophy or leukoplakia. This suggests a relationship between the appearance of such lesions and the lack of certain dietary factors present in yeast.—*Cancer Res.*, 2:381, June 1942. J. E. GILDA.

Histologic Study on the Effects of Fluorine Administered in Dry and Moist Diets on the Teeth of Young Albino Rats.

By M. M. HOFFMAN, CECELIA SCHUCK and W. J. FURUTA

THIRTY-THREE albino rats were weaned at 21-24 days of age and were placed on fluorine-containing diets. The pigment and gross and histologic changes in the incisors and molars showed that the animals which received the fluorine in water (0.05 per cent sodium fluoride) were most severely affected; those that received it in milk, next, and those receiving it in dry diet, the least. Histologic changes in all experimental groups were as follows: (1) degeneration of ameloblasts with enamel hypoplasia and cystic formations; (2) accentuation of incremental lines in enamel and dentin with rate of incrementation remaining normal (approximately 16 microns); (3) rachitic-like changes in the dentin of incisor and molar teeth (interglobular dentin); (4) occurrence of excessive osteoid tissue in alveolar bone; (5) retarded eruption of third molars, and (6) persistence of organic enamel matrix in incisors and third molars, possibly associated with poor mineralization. Findings indicate that crystallization of mineral salts in enamel may be *en masse* and probably occurs at the cessation of the functional morphologic and chemical differentiation of the organic matrix. Findings also suggest disturbances in the physiologic economy of calcium-phosphorus metabolism in the presence of fluorine despite adequate mineral intake.—*J. D. Res.*, 21:157-170, April 1942.

Effective Duration of Some Agents Used for Dentin Sterilization

By SAMUEL SELTZER

SHAVINGS of the dentin of cavities which had one year before been excavated and treated with an antiseptic were cultured. Bacterial growth was observed in 56 per cent of the cases. However, it was noted that, in the control group (no antiseptic treatment), ten (83 per cent) of twelve cases gave positive reactions at the end of a year, whereas, in the remainder (sealing plus antiseptic treatment), only forty-two (73 per cent) of fifty-eight cases were positive at the end of a year. If leakage is taken into consideration, it is concluded that antiseptic treatment of the dentin is of definite value in inhibiting bacterial growth in the dentin.—*J. D. Res.*, 21:115-123, April 1942.

Effect of Dietary Fluorine in Delaying Dental Caries

By J. F. MCCLENDON and W. C. FOSTER

EVIDENCE collected for twenty years indicates that fluorine is beneficial to the teeth, whereas the majority of workers have been interested in discovering the deleterious effects of fluorine. This is the first investigation in which the fluorine content of the diet was determined (0.3 parts per million). Addition of teeth or tooth salts to a cracked cereal diet containing 0.3 parts per million of fluorine slightly delayed dental caries in rats. The addition of 9 or 10 parts per million of fluorine as fluoride to the drinking water delayed caries further (from forty days to one hundred and sixty days) and increased the fluorine content of dentin six times and enamel three times.—*J. D. Res.*, 21:139-143, April 1942.

Dental Conditions Among Prehistoric Indians of Northern Alabama

By SAMUEL RABKIN

AN examination of 2,905 prehistoric In-

dian skulls from Northern Alabama revealed a very low incidence of caries and a high rate of alveolar disease. The Indians of that region consisted of three successive groups, the first living circa 1,000-2,000 years ago and continuing to about 1,400-1,600 A.D. They also represented separate cultures and diverse food habits. The earlier group, who were preagricultural, subsisted on marine life, wild game and land animals. Their successors lived on a varied diet including carbohydrate obtained from cultivated maize and, no doubt, bread. Whatever may have been responsible for the existing condition, the examination disclosed the first group to be less predisposed to tooth decay than the last. Alveolar disease, especially abscess cavities, prevailed among most of the members of the three groups. This caries was due to extensive wear of the teeth and pulp involvement. Many physical and structural alterations in the shape and size of the head, jaws and teeth took place between the first and last group. To the student of dental pathology, such evidence may be highly significant, and an object lesson of analysis comparing the present with the past rather than subordinating all inquiry to current speculations.—*J. D. Res.*, **21**:211-232, April 1942.

Dental Studies of Triplets. 1. Measurements of Arch Width and Length

By J. T. COHEN, C. P. OLIVER, and S. BERNICK

DENTAL measurements representing the arch size for nine sets of triplets and three sets of non-related individuals were determined. The degree of concordance based upon the "corrected identical measurements" was determined for each combination of the members of a set. Five of the triplet sets had each one pair of identical twins as determined by other criteria. Only two of the five had relatively identical measurements, the three other sets being no more identical in their measurements than fraternal and non-related sets. From our studies, it seems that likeness in the arch measurements of the twins is due not only to a common heredity, but also to like age and sex; and that part of the unlikeness in identical sets is due to extrinsic factors such as mutilation and exfoliation leading to temporary arch conditions. These factors make it difficult to use dental measurements taken at a definite period of arch growth as a means of determining monovular origin.—*J. D. Res.*, **21**: 233-239, April 1942.

Electronics in Dentistry

By ALLEN M. OLINGER, JR.

ELECTRONICS presents a new field of possibilities for dentistry. It has been widely used in other fields and is gradually coming into favor in the medical sciences.

Operative dentistry is too dependent on the human element. This is not conducive to uniformity of technic and often leads to failure.

The electrolytic deposition of gold or silver in the prepared cavity is not altogether impracticable. The chief problem to be overcome is that of making the human vital tooth a suitable anode.—*Contact Point*, **19**:145-147, January 1942.

BYRON MILLER.

Habits as a Source of Malocclusion

By LEONARD LING

AMONG several habits which may cause or aggravate a tendency toward malocclusion are finger sucking, thumb sucking, lip biting, abnormal tongue pressure upon the teeth, supporting the head with the hands, sleeping on the face and mouth breathing. Modification of a habit which may be a cause of malocclusion can be considered as part of the treatment.—*Contact Point*, **19**:169-171, 1942.

BERNARD AARONS.

Heat Treatment of Gold Alloy

By EDWARD AVAKOFF

EMBARRASSING dental gold mishaps can be prevented to a certain degree by heat treatment. Heat treatment of alloys (gold) dates back to Russian workers who discovered two compounds were formed, AuCu and AuCu3. These were precipitated out of the solid solution of a gold alloy if the temperature was between 700 and 480° F. With reheating and quenching, these compounds disappear into the solid solution, which has properties of pure gold. With stainless steel alloys and new gold alloys, heat treatment is necessary to obtain maximum results.

Hardness of an alloy is defined as resistance to plastic deformation, which depends upon the ability of atoms to glide along

crystallographic planes, hardness being a valuable standard by which to judge heat treatment. With the introduction of foreign atoms, distortion of the lattice of the structure results, acting to hinder or prevent slipping along the gliding planes. If the atomic radius of foreign atoms is greater than that of silver or gold, distortion occurs, with the result that the hardness increases. Rolling and bending harden gold alloys and heating relieves the strains. Heat treatment should be worked out for each metal and alloy directly. The deciding factor in heat treatment appears to be the decrease in elongation. If minimum elongation is needed, hardness can be increased.—*Contact Point,* 19:133-137, January 1942.

Nitrous Oxide Analgesia

By JOHN V. OULLIBER

ANALGESIA is often employed in conjunction with procaine anesthesia. It is valuable in establishing good will. To assure the success of the operation, the dentist should control the machine, with a capable assistant to call attention to any irregularities before or during the operation. However, nitrous oxide cannot be administered by any fixed rule. The lower jaw must always be supported. In restoring the patient to normal, artificial respiration should be modified for those patients who are abnormal. The significant abnormalities are pulmonary disturbances, hypertension, status lymphaticus, diabetes, hyperthyroidism and sweating. A liberal supply of oxygen is necessary for very young children.—*Contact Point,* 19:245-251, April 1941.

J. MALCOLM BOOTH.

Rôle of the Lymphatics in the Health and Disease of the Oral Cavity

By BERNARD F. ROBERTS and HERBERT E. WARD

LYMPHATICS are a subsidiary circulatory mechanism steadily engaged in moving back to the blood fluid which has left the blood capillaries. They are vessels derived from vein endothelium, invading the body as do blood vessels, only not so complete, since there are certain structures which never receive them. The lymphatics drain into two constant openings in the right and left subclavian veins.

Infections in the neck and floor of the mouth are usually due to secondary infection from the throat and teeth. Lymphadenitis and cellulitis result from secondary infection. Recovery is uneventful if drainage is applied. Neglect may lead to invasion of deeper tissues and death. X-ray therapy is the most efficacious treatment.

Lymph drainage cannot be extinguished by being cut off with radical dissection of the lymph nodes in the groin and the iliac vessels.—*Contact Point,* 19:233-239, April 1942.

A. SEYMS.

Control of Dental Pain

By ELDRIDGE K. TURNER

CONTROL of dental pain in cavity preparation is attained by the use of a rubber dam for a dry cavity, with intermittent pressure below the dentino-enamel junction on an inverted cone bur revolving at about 1,500 to 2,000 revolutions per minute. If formation of secondary dentin is desired before proceeding, a zinc phosphate cement seal should be placed on the cavity after all decay is excavated. At all times, avoiding heat decreases pain, and to have instruments sharp is of the utmost importance.—*Contact Point,* 19:208-212, March 1941.

A. CACEREZ-LOPEZ.

Sulfanilamide and Its Dental Uses

By SAMUEL BROWN

THE spectacular results achieved from administration of sulfanilamide make it advisable to outline the therapeutic properties of the drug, in relation to dentistry, in order to prevent its improper use. The internal administration of the drug should never be attempted by the dentist except in cooperation with a physician. Sulfanilamide is of value in the treatment of streptococcic infection of the mouth and jaws, but its greatest value to dentistry is in the treatment of infections following tooth removal or tooth or jaw disorders. The drug is of doubtful value in the treatment of gingival infections.—*Contact Point,* 19:182-185, 1942.

RICHARD HESSE.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF ORAL DIAGNOSIS, Boston, Mass., November 12-13.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York, N. Y., October 26.

CHICAGO DENTAL SOCIETY, February 22-25, 1943.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month, from October to June at the United States Public Health Service Auditorium, Washington.

MONTREAL (CANADA) DENTAL CLUB FALL DENTAL CLINIC, September 23-25.

NATIONAL DENTAL ASSOCIATION, Nashville, Tenn., August 10-14.

GREATER NEW YORK DENTAL MEETING, New York, December 7-11.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 9-10.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, November 3-5.

PACIFIC COAST SOCIETY OF ORTHODONTISTS, San Francisco, Calif., February 22-24, 1943.

WISCONSIN STATE DENTAL ECONOMIC STUDY CLUB, Madison, July 24-25.

STATE SOCIETIES

September

Southern California, at Los Angeles (14-16)

November

Florida, at Tampa (9-11)
Ohio, at Cincinnati (9-11)

STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, February 15 and April 19, and at Los Angeles, March 22. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco.

New Jersey, September 15-19. Walter A. Wilson, 150 E. State St., Trenton, Secretary.

Wisconsin, at Milwaukee, October 5-9. Stephen F. Donovan, Tomah, Secretary.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF ORAL DIAGNOSIS

THE ninth annual congress of the American Association for the Advancement of Oral Diagnosis will be held in Boston, November 12-13, at the Forsyth Dental Infirmary. The subject of this year's congress will be "The Military Aspects of Oral Diagnosis." Members of the medical and dental professions in the United States and countries of the Western Hemisphere who are interested are invited to attend and can obtain programs by addressing H. Justin Ross, 515 Madison Ave., New York, N. Y.

SHIRLEY DERAAY, *Executive Secretary.*

AMERICAN ASSOCIATION OF DENTAL EDITORS

THE Boston meeting of the American Association of Dental Editors has been cancelled. Plans are being developed for holding a business meeting in St. Louis the latter part of August. Members will be advised when arrangements are complete.

O. W. BRANDHORST, *Secretary,*
4952 Maryland Ave.,
St. Louis, Mo.

AMERICAN COLLEGE OF DENTISTS

THE Boston convocation of the American College of Dentists has been cancelled. Arrangements are being made for a meeting of the regents in St. Louis the latter part of August. Fellows will be advised when arrangements have been completed.

O. W. BRANDHORST, *Secretary,*
4952 Maryland Ave.,
St. Louis, Mo.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE fall meeting of the American Society for the Advancement of General Anesthesia

in Dentistry will be held October 26 at the Midston House, Thirty-Eighth St. and Madison Avenue, New York, at 8:30 p.m. The president, James R. Cameron, of Philadelphia, will preside. Adolph A. Walkling, associate professor of surgery, Jefferson Medical College, Philadelphia, will read a paper on anesthesia best suited for injuries and infections of the head and neck. Tracheotomy procedure will be demonstrated with lantern slides.

M. HILLEL FELDMAN, *Secretary,*
730 Fifth Ave.,
New York.

CHICAGO DENTAL SOCIETY MIDWINTER MEETING

THE 1943 Midwinter Meeting of the Chicago Dental Society will be held at the Palmer House, February 22-25.

HAROLD W. OPPICE, *Secretary.*

MONTREAL FALL CLINIC

THE Eighteenth Annual Fall Clinic of the Montreal Dental Club will be held in the Mount Royal Hotel, September 23-25. A full program of papers, clinics and demonstrations is being prepared. The preliminary program will appear in THE JOURNAL at an early date. Those desiring a copy are asked to apply to M. L. Donigan, 1414 Drummond St., Montreal. Exhibitors desiring information regarding space, rates, etc., are asked to write to J. A. Carney, 5292 Queen Mary Road, Montreal.

NATIONAL DENTAL ASSOCIATION

THE National Dental Association will hold its twenty-ninth annual session August 10-14 at the Meharry Dental College, Nashville, Tenn. For further information, address

J. A. JACKSON, *Secretary,*
Charlottesville, Va.

GREATER NEW YORK DENTAL MEETING

THE next Greater New York Dental Meeting will be held in the Hotel Pennsylvania, New York, December 7-11.

WALTER A. QUINN, *Chairman,*
Press and Publication.

NEW YORK SOCIETY OF ORTHODONTISTS

THE next meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, November 9-10.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE Odontological Society of Western Pennsylvania will hold its sixty-first annual fall meeting November 3-5 in the William Penn Hotel, Pittsburgh.

M. H. SMITH, *Office Secretary.*

PACIFIC COAST SOCIETY OF ORTHODONTISTS

THE next meeting of the Pacific Coast Society of Orthodontists will be held in San Francisco February 22-24, 1943.

EARL F. LUSSIER, *Secretary,*
450 Sutter Bldg.,
San Francisco.

PSI OMEGA FRATERNITY

THE National Alumni Chapter of the Psi Omega Fraternity desires to announce that, owing to the postponement of the Annual Meeting of the American Dental Association, and desiring to cooperate in matters of national defense, the Chapter has voted to cancel its proposed meeting activities August 24-25.

GERALD A. MITCHELL, *Grandmaster,*
GORDON L. TEALL, *Secretary.*

WISCONSIN STATE DENTAL ECONOMIC STUDY CLUB

THE twelfth annual meeting of the Wisconsin State Dental Economic Study Club will be held at the Hotel Loraine, Madison, July 24-25. Dentists and their wives, dental assistants and guests are invited. Dentists must present A.D.A. membership cards. For additional information, address

NORMAN C. JOHNSON, *Secretary,*
905 University Ave.,
Madison.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Southern California State Dental Association will be

held at the Los Angeles Biltmore Hotel, September 14-16.

ROBERT L. BORLAND, *Secretary,*
602 Chapman Bldg.,
Los Angeles.

FLORIDA STATE DENTAL SOCIETY

THE next annual meeting of the Florida State Dental Society will be held at Tampa, November 9-11.

W. P. WOOD, JR., *Secretary,*
442 W. Lafayette St.,
Tampa.

OHIO STATE DENTAL SOCIETY

THE next annual meeting of the Ohio State Dental Society will be held at the Netherland-Plaza Hotel, Cincinnati, November 9-11.

EDWARD C. MILLS, *Secretary,*
255 E. Broad St.,
Columbus.

BOARD OF DENTAL EXAMINERS OF CALIFORNIA

THE next examinations to be conducted by the Board of Dental Examiners of California for a license to practice dentistry and for a license to practice dental hygiene in California, will be held in San Francisco, commencing on February 15, 1943, in Los Angeles, commencing on March 22, 1943, and again in San Francisco commencing on April 19, 1943. All credentials must be in the office of the Secretary, Room 203, 515 Van Ness Avenue, San Francisco, at least twenty days prior to the date of the examinations. Address all communications to Kenneth I. Nesbitt, Secretary, Room 203, 515 Van Ness Avenue, San Francisco.

NEW JERSEY STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY

THE State Board of Registration and Examination in Dentistry in New Jersey will hold its next examinations, commencing September 15 and continuing for four days. The following spring examinations will be held commencing April 4, 1943, and continuing for five days. Upon application to the secretary, a copy of the requirements and rules, instruction sheet and preliminary application will be sent. Any person desiring to apply as a candidate must file the preliminary application blank, together with the examination fee of $25, on or before February 15 for the succeeding April examinations and before August 15 for the succeeding September examinations.

WALTER A. WILSON, *Secretary,*
150 E. State St.,
Trenton, N. J.

STATE OF WISCONSIN BOARD OF DENTAL EXAMINERS

THE State of Wisconsin Board of Examiners will hold its next examination at Marquette Dental School, Milwaukee, October 5-9. Examinations will be given for licensure of dentists and hygienists. All applications must be in by September 29. For application blanks and information, address

STEPHEN F. DONOVAN, *Secretary,*
Tomah.

LOCATIONS FOR DENTISTS

A NEED for additional dentists exists in many of the vital defense areas. These shortages have arisen because of the great increase in civilian population that has occurred during the year. At present, needs exist in a number of states in communities varying in size from small villages to large cities. A continuing increase in population will result in overtaxing the dental personnel in many other localities where at present the dentists are very near the limit of their capacities. In many of these defense areas, there are defense housing projects in which office space or living accommodations, or both, may be secured. The United States Public Health Service, in cooperation with the Division of Defense Housing of the Federal Works Agency, which supervises these projects, is interested in acquainting dentists with the needs of these communities. If you are interested in securing more specific information about localities for the establishment of practice, communicate with

THOMAS PARRAN, *Surgeon General.*

DENTAL RESIDENCY

THE University of Oregon Medical School Hospitals and Clinics offers a residency in dental medicine and oral surgery, the period of service to be one year, with compensation $40 monthly, in addition to board, room and laundry. The division is under the general direction of the department of medicine

and the direct supervision of the head of the division and a visiting staff of sixteen dentists. Service is carried on in the outpatient clinic and the three hospitals. Application blanks will be furnished on request. Direct inquiries to

RICHARD B. DILLEHUNT, *Dean,*
University of Oregon Medical School,
Portland.

RESEARCH FELLOWSHIP IN MEDICINE AND DENTISTRY AT THE UNIVERSITY OF ILLINOIS

THE Graduate School of the University of Illinois has established four research fellowships to be awarded for one year in the fields of medicine and dentistry in Chicago at a stipend of $1,200 per year (calendar year with one month's vacation). Candidates for these fellowships must have completed a training of not less than eight years beyond high school graduation. This training may have been acquired in any one of the following ways, or the equivalent thereof: 1. Work leading to the B.S. and M.D. degrees. 2. Work leading to the B.S., M.S., and D.D.S. degrees. 3. Work leading to the B.S. and B.A. degrees in a four-year collegiate course and to the D.D.S. degree. 4. Work leading to the B.S., D.D.S. and M.D. degrees. The fellowship year begins September 1. Formal application blanks can be secured from the Secretary of the Committee on Graduate Work in Medicine and Dentistry, 1853 W. Polk St., Chicago, Ill.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Carnegie Dental Fellow and, according to his interest, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
School of Medicine and Dentistry,
Rochester, N. Y.

NEW YORK UNIVERSITY COLLEGE OF DENTISTRY POSTGRADUATE COURSE

THE New York University of Dentistry announces a postgraduate course in inhalation anesthesia, with special emphasis on nitrous oxide-oxygen anesthesia, conducted by E. A. Rovenstine, professor of anesthesia, N. Y. U. College of Medicine and Bellevue Hospital, and A. S. Mecca, assistant professor of oral surgery, N. Y. U. College of Dentistry and Bellevue Hospital. The course will be given on Friday mornings October 2 to November 6 inclusive. Direct all communications to the office of the dean, N. Y. U. Dental College, 209 E. 23rd St., New York, N. Y.

COLUMBIA UNIVERSITY SCHOOL OF DENTAL AND ORAL SURGERY REFRESHER COURSES

COLUMBIA University School of Dental and Oral Surgery offers a short course in periodontia for qualified graduates in dentistry September 18, 1942, to January 15, 1943.

A ten-day intensive course will include lectures, discussions, demonstrations and clinical practice. An extended course, one half day per week for two sessions, will include lectures, discussions and supervised technical treatment. Both courses will be conducted by Frank E. Beube, Isador Hirshfeld, Harold J. Leonard (executive officer) and Arthur H. Merritt.

The courses given at the School of Dental and Oral Surgery, Columbia University, are designed to be "refresher" courses; i.e., to bring practitioners abreast of modern under-

graduate teaching in theory and practice in the subject. Admission to the course is limited to qualified graduates in dentistry who are members in good standing of the American Dental Association or recognized sectional organizations. In the case of foreign applicants, membership in the applicant's national dental organization is required.

Information can be obtained from the registrar, School of Dental and Oral Surgery, 630 West 168th Street, New York, N. Y.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING JUNE 1942

June 2

2,284,774, ARTHUR E. SMITH. Hypodermic syringe.

2,285,179, FREDERIC TRYFUS. Artificial tooth.

June 9

2,285,505, MELVIN C. GRANT and MARION E. FROST. Rotary toothbrush.

2,285,865, EDGAR P. LOWE and ALLEN V. LOWE. Toothbrush.

2,285,943, KURT RIESENFELD. Dental x-ray photography.

2,286,021, HORRIE BURTON STANFORD. Dental matrix clamp.

June 16

2,286,288, MATTHEW J. LOVER. Dental bite recorder.

2,286,372, RICHARD W. PAGE. Adjustable chair.

2,286,599, EDWARD L. CHOTT. Mortar and pestle.

2,286,600, EDWARD L. CHOTT. Dental amalgamator.

2,286,718, DAVID CURTIS. Anesthetic compound and solvent for the same.

2,286,748, FREDERICK C. MARTIN. Dental x-ray package.

June 23

2,287,058, ALPHONSE F. PIEPER. Dental apparatus.

2,287,260, JAMES VERNON LUCK. Surgical instrument.

2,287,327, ADOLPH RICKENBACHER. Toothbrush.

2,287,508, HERBERT R. BERGER. Dental casting machine.

2,287,509, HERBERT R. BERGER. Dental casting machine.

June 30

2,287,874, FRANCIS J. GIBBONS and JOHN J. GIBBONS. Lamp holder attachment for dental hand pieces.

2,287,910, ALBERT N. SLACK. Tool for holding dental instruments for sharpening.

2,288,011, ALBERT D. MIZZY. Teeth separator.

2,288,334, ELMER B. VLIET and MARJORIE B. MOORE. Local anesthetic.